HIGHWAY PROGRESS, 1959

Annual Report of

The Bureau of Public Roads

Fiscal Year 1959

Paving operations on Interstate Route 40 in North Carolina

U.S. DEPARTMENT OF COMMERCE

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BUREAU OF PUBLIC ROADS

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Annual Report, Fiscal Year 1959

CONTENTS

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ANNUAL REPORT OF THE BUREAU OF PUBLIC ROADS

Summary Review of the Fiscal Year

THE fiscal year 1959[1] was marked by continued vigorous growth of the expanded nationwide highway construction program inaugurated by the Federal-Aid Highway Act of 1956. Interstate highways were being planned and built across the country on vital urban and intercity routes while construction continued unabated on major highways and streets and on the vast mileage of secondary roads.

Expenditures on all roads and streets, by all levels of government, for engineering, right-of-way, and construction costs were estimated at $6.21 billion in calendar year 1958 and it was anticipated that they would reach $7.14 billion in calendar year 1959.

Highway usage continued to increase. Motor-vehicle registrations were forecast to reach a record high of 70.4 million in calendar year 1959, 3.1 percent more than in the preceding year. During calendar year 1959, travel by these vehicles will reach an estimated 700 billion vehicle-miles.

The Bureau of Public Roads had set a fiscal year goal of $3.075 billion in Federal-aid obligations for surveys and plans, right-of-way acquisition, and construction. Actual obligations of the year totaled $3.223 billion, as compared with $2.749 billion obligated in the previous fiscal year.

Federal-aid operations of the year were supported largely with funds authorized by the Federal-Aid Highway Acts of 1956 and 1958. On August 1, 1958, Federal-aid funds for fiscal year 1960, amounting to $3.4 billion, were apportioned to the States. The total of Federal-aid funds apportioned since the passage of the Federal-Aid Highway Act of 1956 was thus brought to $10.55 billion.

Accomplishments of the year

Projects for the construction of 30,923 miles of improvements were programed during the year in the Federal-aid and Federal highway programs. Contracts were awarded during the year for improvements to 25,154 miles of roads and streets. Construction put in place during the year involved $2.875 billion of Federal funds, an increase of 74 percent over the previous year.

Completions of all classes of Federal-aid and Federal projects during the fiscal year provided improvements on 32,828 miles of roads and streets. Included were 31,715 miles of highways and 6,746 bridges on the Federal-aid systems and 1,113 miles of roads in national forests, parks, and parkways, and on flood-relief and access-road projects.

Hazards at railway-highway grade crossings were removed during the year by elimination of 391 grade crossings, reconstruction of 36 inadequate grade-separation structures, and protection of 402 crossings by installation of flashing

[1] The fiscal year 1959 extended from July 1, 1958, through June 30, 1959.

lights or other safety devices. These figures include the separation or protection of crossings encountered on new highway locations.

The linear mileage of highway improvements completed is not a full measure of the facilities provided for traffic, since most of the Interstate and some of the other Federal-aid construction were four or more lanes wide. The 31,715 miles of Federal-aid projects completed during the year included 3,589 miles of four-lane highways and 184 miles having six lanes or more. Thus, the year's Federal-aid project completions provided the equivalent of 71,336 miles of single-lane construction.

At the year's end, in the Federal-aid program, construction was underway or plans had been approved for improvements on 35,790 miles of highways and streets. Included were construction of 11,278 bridges and the elimination, reconstruction, or protection of 1,191 railway-highway crossings. The estimated cost of this work was $8.0 billion, of which $5.9 billion was Federal aid.

In addition, at the close of the year, the programs for construction of national forest, park, and public lands highways, defense access roads, and flood-damaged roads and bridges, included improvements underway on 1,578 miles, at a total estimated cost of $138 million including $121 million of Federal funds.

The Interstate System

Federal-aid improvements under the primary, secondary, and urban programs progressed on a larger scale than ever before, but the Interstate System maintained its position as the focal point of public interest in highways. As sections were opened to traffic, more and more motorists began experiencing the advantages of the controlled-access freeway with its freedom from cross traffic, greater comfort and safety, and savings in travel time and vehicle operating costs. Residential, commercial, and industrial centers developed adjacent to the Interstate right-of-way, in some cases, while highway construction was barely underway.

Locating such important and complex facilities was not left to chance. The State highway departments conducted extensive engineering and economic studies and coordinated the Interstate locations with the arterial highway systems in cities by close liaison with local officials and planning bodies, to assure selection of locations in the overall public interest. Public hearings were held so that proposals could be explained and the opinions and facts developed by interested groups and individuals could be presented. The transcripts of all hearings were carefully reviewed by the State highway departments and Public Roads and all information and data presented were evaluated to assure that the economic effect on local interests was considered in selecting the ultimate location and design.

Interstate System projects, because of their dimensions, intricacy, and impact on the areas they traverse, usually require several years to accomplish the planning and locating plus surveys, design, and acquisition of right-of-way, before actual construction can be understaken. Only recently, therefore, could the real impact of Interstate System progress be felt in terms of completed facilities. The "Progress Report on the Federal-Aid Highway Program," completed during the fiscal year at the request of the Congress, showed that by December 31, 1958, improvements substantially meeting approved standards and at least adequate for current traffic had been completed on 4,831 miles of the Interstate System and that during calendar year 1958, 2,078 miles of high-type pavement were placed under construction.

Interstate financing

Progress of the Interstate System program at the end of the fiscal year was threatened by two financial problems. The first was immediate, and stemmed

from a more rapid depletion of the accumulated highway trust funds than was anticipated in the original legislation, resulting from accelerated spending called for by the Federal-Aid Highway Act of 1958.

Under the Federal-Aid Highway Act of 1956, the Federal-aid program is financed on a pay-as-you-go basis from Federal highway-user taxes which go into the highway trust fund. Net income of the trust fund during the fiscal year was $2.2 billion; expenditures from the fund for Federal-aid highways amounted to $2.6 billion. This was the first year that expenditures had outweighed receipts. Apportionments for fiscal year 1960, which the 1958 act directed were to be made in the full amount authorized, were considerably more than anticipated revenues would be adequate to finance. It was recognized that this action would deplete the surplus accumulated through the earlier years of the trust fund and would preclude the apportioning of any funds for the Interstate System for fiscal year 1961. At the end of fiscal year 1959, congressional action to remedy this situation was pending but had not yet been accomplished.

There was, in addition, a long-range problem of financing the Interstate System program. The new estimate of the cost of completing the Interstate System presented to the Congress during fiscal year 1958 showed that Federal and State matching financing required after July 1, 1956, amounted to $37.6 billion, as compared with the $27.6 billion available from authorizations of the Federal-Aid Highway Acts of 1954 and 1956 together with State matching funds.

A new detailed estimate of the cost of completing the Interstate System will be presented to the Congress in 1961. From this estimate and the results of the highway cost allocation study the Congress will have in 1961 a wealth of information as a basis for considering the appropriate scheduling and financing of Interstate and other Federal-aid programs; and for the equitable distribution of taxes to support the programs among the classes of highway users and other beneficiaries.

Construction contracts and prices

The Federal-aid highway construction program is accomplished under the traditional American practice of competitive bidding for contracts let by the States. Competition was spirited during the fiscal year, with an average of seven bidders per contract. Approximately 600 new contractors entered into bidding during the year. Awards for Federal-aid primary contracts averaged slightly less than two contracts per contractor.

During the fiscal year, 9,987 Federal-aid construction contracts were awarded: 4,461 on the primary system, of which 38 percent were for Interstate System work, and 5,526 on the secondary system. All contracts let for urban work were included in the total for the primary system.

The trend of stabilization in highway construction bid prices, which began in the second quarter of fiscal year 1957, continued throughout fiscal year 1959. The net decrease during this period was 3.2 percent. The composite index for the first quarter of fiscal year 1957 was 167.2 (1925–29 average=100) which was 11.9 percent above the low point of 149.4 at the end of fiscal year 1955, but the index for the fourth quarter of fiscal year 1959 was 163.1 or 2.5 percent below the first quarter of 1957.

Highway construction wage rates increased 5.0 percent during the year, but as a result of continually improving productivity in highway construction, the cost of labor increased only 1.0 percent. The costs of highway construction materials rose 1.3 percent and equipment ownership costs increased 3.1 percent during the year. The weighted average increase of labor, materials, and equipment ownership costs was 1.7 percent compared with an increase of 2.8 percent in the previous year.

Research

Public Roads, in cooperation with the State highway departments and others, completed an intensive study in the field of highway safety and continued two other studies involving the allocation of highway cost responsibilities and benefits and the maximum desirable vehicle size and weight limitations. All of these studies were undertaken in connection with three reports requested by the Congress.

In its own offices and laboratories, and through cooperative projects, Public Roads continued to carry on research in a wide range of fields related to highways and transportation. Public Roads is also collaborating with the States and others in the AASHO Road Test, an intensive investigation of the performance of cement concrete and bituminous pavements and of bridges under varied weights of controlled traffic.

Other subjects of note

All projects financed with so-called "D" funds, the special $400 million authorized under the Federal-Aid Highway Act of 1958, were placed under contract by December 1, 1958, according to schedule.

Public Roads operations in foreign countries continued to bear fruit. A difficult 25-mile gap on the Inter-American Highway in northern Guatemala was graded and opened to traffic. In other Central American countries, many sections of the same highway, which were formerly described as only passable, were being paved. During the fiscal year, Public Roads missions in Lebanon and the Sudan were expanded while assistance to Turkey was terminated after successful accomplishment of the mission.

Engineering productivity continued to increase with the constantly expanding use of electronic computers, aerial photography, and other scientific developments. Modern techniques, applied during the planning and design phases of highway projects, produced considerable savings in construction costs and released funds which were made available for additional urgently needed highway work.

For those who are unfamiliar with the Federal-aid program, a brief account of its development follows. Accomplishments of the year on the several Federal-aid systems and the Federal lands highway programs plus detailed information on the subjects previously mentioned can be found in individual presentations in other sections of this report. Supporting statistics, both in summary and detail, appear in the appendix tables.

Development of the Federal-Aid Program

Federal aid to the States for highway improvement had its modest beginning in the Federal-Aid Road Act of 1916. Through the years, without interruption except in World War II, the program has continued to grow in size and importance commensurate with the explosive growth of motor-vehicle transportation in the United States. For almost three decades, use of Federal aid was restricted to rural portions of what now constitutes the Federal-aid primary highway system, an extensive network including most of the country's main-traveled roads. Since 1944 Federal aid has also been extended to the urban portions of this system, and to a Federal-aid secondary highway system of farm-to-market roads.

In 1944 also, the National System of Interstate and Defense Highways was brought into being. This Interstate System, as it is commonly called, is limited to 41,000 miles in extent, and constitutes the most important portions of the Federal-aid primary system. Federal-aid funds, however, were not specifically

authorized for the Interstate System, or were provided only in relatively modest amounts, until 1956.

The Federal-Aid Highway Act of 1956, augmented by the Federal-Aid Highway Act of 1958, authorized a tremendously enlarged highway program which, in its entirety, will be the greatest peacetime construction program in history. While extending at an increased rate the traditional aid for primary, secondary, and urban highway improvements, the act authorized Federal aid over a 13-year period for completion of the Interstate System. The 1956 act also established a Federal highway trust fund to receive Federal highway-user excise taxes and from which funds for Federal highway aid are disbursed.

The Federal-aid authorizations are made in four categories: For the Interstate System, and for primary, secondary, and urban highways—the latter group now often referred to as the ABC program. The 1956 and 1958 acts authorized $25.6 billion of Federal aid for the Interstate System, spread over the 13 fiscal years 1957–69. Authorizations for the ABC program, usually made biennially, have risen $25 million annually in recent years, from $825 million for fiscal year 1957 to $925 million for 1961. Federal-aid funds are apportioned among the States according to formulas prescribed by law.

Interstate funds are matched by the States on a 90-percent Federal, 10-percent State basis; the ABC funds are matched 50–50. States with large areas of public lands match on a proportionately reduced scale. Federal aid may be used only for highway improvements, not for maintenance. The program is a cooperative enterprise in which the States have the initiative and responsibility for the selection, design, and construction of the Federal-aid projects, subject to review and approval of each stage by the Bureau of Public Roads.

As of December 31, 1958, the Federal-aid primary system totaled 260,170 miles in extent, including the Interstate System. There were 554,953 miles in the Federal-aid secondary system. The urban portions of the primary and secondary systems totaled 34,052 miles.

Legislation

On November 10, 1958, national standards for regulation by States of outdoor advertising signs, displays, and devices adjacent to the National System of Interstate and Defense Highways were issued in conformity with the intent of Congress as set forth in section 12 of the 1958 act, now codified as section 131, title 23, United States Code. Prior to their adoption by the Secretary of Commerce, tentative standards were published in the Federal Register on August 28, 1958, and all who were interested were invited to submit their comments, criticisms, and suggestions. Some 275 pieces of correspondence were received, analyzed, and correlated before final action was taken.

During the 1959 State legislative sessions, more than 30 States considered legislation to control advertising along the Interstate System in accordance with the national policy established by Congress. Most of the bills did not receive favorable consideration, and only a few States have enacted legislation which may enable them to implement control to the extent necessary to comply with the law and the standards. In addition, a few State legislatures postponed action on the subject pending reports by legislative study groups.

Codification of Federal highway laws

The Federal laws pertaining to highways were set forth in more than 40 separate enactments, beginning with the original Federal-Aid Road Act of 1916. Many of these enactments, at least in part, overlapped, were contradictory, or were obsolete.

In response to the direction of Congress made in section 12 of the Federal-Aid Highway Act of 1954, the Department of Commerce recommended to the Congress a draft of a bill to consolidate, in a single codified law, all of the pertinent and permanent portions of existing Federal highway legislation. The bill was enacted and approved on August 27, 1958, as Title 23, United States Code, "Highways."

The National System of Interstate and Defense Highways

The National System of Interstate and Defense Highways is a planned, integrated network of the Nation's most heavily traveled routes, connecting the country's metropolitan areas and industrial centers, serving the national defense, and connecting with routes of continental importance in Canada and Mexico. Created by the Federal-Aid Highway Act of 1944, the general locations of 37,700 miles of city-to-city routes were officially designated in 1947, and 2,300 miles of routes into, through, and around cities were designated in 1955.

The Federal-Aid Highway Act of 1956 provided a 1,000-mile increase in the limitation of the Interstate System, bringing its total extent to 41,000 miles. In connection with this permitted expansion, the States proposed selections for additions to the system totaling 13,775 miles. The proposals were considered on a national basis, as required by law, taking into account as basic factors the needs of national defense, system integration, transportation requirements of industry and agriculture, and population service.

Meanwhile, it was found that a considerable mileage saving had resulted from adoption of more direct alinements than the existing highways, as the States selected detailed locations for the routes of the originally designated 40,000 miles of the system. As a consequence it was possible to select for system designation 1,000 miles of routes under the allowable expansion and an additional 1,102 miles of routes from the mileage savings realized.

As of December 31, 1958, the designated Interstate System totaled 40,675 miles, of which 35,917 were rural and 4,758 were urban. The remainder of the 41,000-mile limitation, amounting to 325 miles, was not assigned to routes but was held in reserve for adjustments of route lengths as final locations were selected and projects were built. The States continued economic and engineering studies to determine the most feasible locations for the Interstate route sections and by the end of the fiscal year, general locations for 40,105 miles had been selected by the States and approved by Public Roads. Included in the Interstate System were nearly 2,300 miles of toll roads. The Federal-aid Highway Act of 1956 permits their inclusion, although Federal aid may not be used for their improvement.

Until 1956, only limited amounts of Federal-aid funds were specifically authorized by Congress for Interstate System improvement, although Federal-aid primary and urban funds could be and were used to a considerable extent for that purpose. The picture changed radically when the Federal-Aid Highway Act of 1956, now augmented by the Federal-Aid Highway Act of 1958, authorized a total of $25.625 billion over the 13-year period 1957–69 for completion of the Interstate System. These funds are matched on a 90-percent Federal, 10-percent State basis.

The $4.9 billion total of Interstate authorizations for fiscal years 1957, 1958, and 1959 were apportioned to the States prior to fiscal year 1959. On August 1, 1958, the $2.5 billion for fiscal year 1960 was apportioned.

Improvements programed during the year on 3,228 miles of the Interstate System were estimated to cost $2.71 billion, including $2.26 billion of Federal-aid Interstate funds.

Improvements involving Federal-aid Interstate funds were completed during the fiscal year on 2,290 miles of the Interstate System at a total cost of $1,325,106,938, of which $1,039,300,909 was the Federal share. Completed work involved 1,356 miles of bituminous and portland cement concrete surfacing, 894 miles of grading, drainage, and temporary surfacing, and 40 miles of structures involving 565 bridges over streams, 1,112 bridges over highways to provide traffic grade separations, and 133 railway-highway grade-separation structures.

At the end of the year planning and construction were going at a rapid pace across the Nation. A total of slightly over $1 billion was in program status, and 3,884 projects with a total estimated cost of $4.8 billion were underway or scheduled to start soon.

Final detailed route selection, surveys and plans, right-of-way acquisition, and construction of projects of the magnitude and complexity involved in the Interstate System often take 3 or 4 years from initial conception to final completion. Many route sections were being built in stages, with an initial project providing for grading and drainage and a subsequent project providing the pavement.

Excluding projects that have only been programed, a total of $6.5 billion had been obligated for the Interstate System at the end of the year, of which 7 percent was for preliminary engineering, 25 percent for right-of-way acquisition, and 68 percent for construction. At the end of the previous year $4.0 billion had been obligated, of which 63 percent was for construction.

Further information of interest concerning the Interstate System is contained in the next section of this report, as well as in the sections on legislation, reports to Congress, and the highway trust fund.

Interstate System Progress: Case Histories

Throughout the Nation, development of the National System of Interstate and Defense Highways continued to gather momentum. Signs of progress were everywhere. As construction on some projects reached completion, and as broad ribbons of freeway were opened to traffic, the public began to realize that the dreams of a few years ago were now becoming a reality. Statistics on funds obligated, mileage of construction underway, and number of projects completed effectively measure performance but a clearer picture of nationwide progress may be gained by examination of individual State activities. It is possible, of course, to present only brief glimpses of a random selection of typical projects completed or underway during the year.

Arizona is rapidly finishing a section of Interstate Route 17 south of Flagstaff. The completed route, passing through a scenic transition from desert to high plateau, will shorten the distance between Phoenix and Flagstaff by 10 miles.

California, in the fiscal year, completed the second Carquinez Bridge and its freeway approaches. Motorists will derive tremendous user benefits from this work by saving 2 miles in distance and 20 minutes in time driving from Sacramento to San Francisco. An outstanding construction feat in building the six-lane 4-mile-long freeway approach to the bridge was the excavation of 9 million cubic yards of earth and rock from the "Big Cut." In southern California, a 4-mile section of the San Diego Freeway was opened to traffic, eliminating a bottleneck at San Juan Capistrano, famous for its old Spanish Mission. Construction was underway on another 16 miles of Interstate Route 5. Completion of this work will provide a continuous freeway from Los Angeles southerly for a distance of 65 miles.

Separate roadway design enhances the vista and reduces the effects of headlight glare on this scenic section of Interstate Route 80 through the Truckee River canyon in Nevada. (Full control of access will be ultimately acquired.)

In Colorado, the final section of the Valley Highway in Denver was completed and opened to traffic. This 11-mile portion of Interstate Route 25 required 62 bridges. Farther south in Colorado, another portion of Route 25 was completed when the 9-mile Pueblo Freeway was opened to traffic. Both of these expressways, going through their respective cities, serve through traffic and aid in the collection and distribution of local traffic.

Connecticut completed two bridges over the Connecticut River during the fiscal year. One of these, the Founders Bridge and its interchange at Hartford, presently serves predominantly local traffic, but will soon function as part of a complex of interchanges knitting together Interstate Routes 91 and 84 with several urban expressways on both sides of the river. The other bridge, on Route 91 at Windsor Locks, is a six-lane structure providing relief for through traffic formerly forced to use a narrow, two-lane truss bridge about a mile to the north.

In Florida, all work on Interstate Route 95 through Jacksonville, and on 40 miles of Interstate Route 10 westerly from Jacksonville, has been let to contract. A portion of the north-south route was completed and opened to traffic during the year, resulting in a marked decline in congestion and accidents.

Idaho recently completed a 7-mile section of Interstate Route 90 over the summit of the Fourth of July Canyon east of Coeur d'Alene. This four-lane divided section, which cost $3.5 million, replaces a winding, inadequate road and a narrow 400-foot tunnel built in the early 1930's. Just a century ago Lt. John Mullan and an Army contingent built the historic wagon road, through this mountainous terrain, that came to bear his name.

In Illinois, a portion of Interstate Route 74, the Peoria Expressway, was opened to traffic during the fiscal year. This new facility provided a much

needed north-south arterial and a new high-level river bridge replacing an old 18-foot pavement and a bascule span which, when open for river traffic, caused extreme congestion. The new structure over the Illinois River provides a 500-foot navigation channel with a 46-foot vertical clearance.

In Iowa, working in cooperation with the U.S. Corps of Engineers, Sioux City, and the Chicago & Northwestern Railroad, the State highway commission is completing the construction of Interstate Route 29 at Sioux City. To permit the highway to pass close to the business district, stockyards, and industrial areas without exorbitant property damage, a considerable area of the Missouri River channel was reclaimed. Widening of a cut in the bluffs for relocation of the railroad provided material for the river fill.

In Kansas, a 21-mile section of Interstate Route 70 was nearing completion, bypassing Abilene on the north and Junction City on the south. To the west, another 22-mile section of the same route was nearly finished.

In Kentucky, progress was being made on the important Covington-Lexington portion of Interstate Route 75. A 7-mile section of six-lane highway costing over $10 million was under construction within the urban area of Covington, to replace a congested four-lane highway which has substandard horizontal curvature, narrow lanes, and a high accident rate. Traffic has grown on this route from 10,000 vehicles per day in 1946 to 21,000 in 1956, and is expected to reach 42,000 by 1975. Grading was underway on 26 additional miles along this route.

In Maine, the fall of 1960 will find 29 new miles of Interstate Route 95 complete and open to traffic, including 24 miles between Augusta and Waterville and a 5-mile section bypassing Bangor on the west and north. This mileage, coupled with that portion of the Maine Turnpike incorporated in the system, will provide the motorist with effective bypasses of all the larger urban areas along the route.

In Maryland, 7 additional miles of the Beltway in southwest Baltimore were opened to traffic during the year. This section, in conjunction with the Harbor Tunnel, completes a bypass of the city for east-west traffic on U.S. Route 40. A 2-mile Beltway section north of Baltimore was also completed.

Massachusetts recently dedicated the Southeast Expressway on Interstate Route 95 in the Greater Boston-South Shore area. This six-lane facility is 20 miles long and runs through the heart of downtown Boston, connecting the city's northern and southern suburbs.

In Michigan, the 34-mile-long Fenton-Clio Expressway, which cost $23 million, was completed at the beginning of the fiscal year. Nearly 22 miles of this facility are on Interstate Route 75 and form a western bypass of the city of Flint. Although 12 miles of this expressway were built with Federal-aid primary funds, which were matched equally by the State, the entire expressway was built to Interstate standards. Comparative studies of the old and new routes showed a saving of 30 minutes travel time going through Flint and an increase of 32 percent in vehicle-miles traveled in the Flint area. A 12-month before-and-after study of the route revealed that on the south 14 miles of the old location there were 264 accidents with 4 killed and 153 injured. On 15 miles of the new location, in a comparable period, there were 27 accidents with none killed and only 16 injured.

In Nebraska, over 17 miles of Interstate Routes 80 and 280 approaching Omaha were nearing completion. A 6-mile section of this is open to traffic. The northeasterly segment, still under construction, consists of a three-level, directional interchange with Interstate Route 280, the western bypass of Omaha. Connections are also furnished to the two principal routes into south Omaha where the world's largest livestock market is located.

Interstate Route 89, west of Concord, N.H., showing the wide median and independent roadway design, preserving the natural growth in the median.

Traffic rolls swiftly and smoothly on this section of the Pacific Highway, Interstate Route 5, south of Salem, Oreg.

In New Hampshire a 4-mile section of Interstate Route 89 has been completed south and west of Concord. Although this route is principally a north-south facility, the recent construction will also materially benefit traffic in the east-west corridor of U.S. 202 between Hopkinton and Concord. Particular attention was given, during construction, to screening borrow areas, preserving natural growth, and accentuating scenic panoramas.

In North Carolina, a 9-mile section of Interstate Route 95 has been completed and opened to traffic, skirting the northwest portion of Charlotte. This new four-lane facility replaces a route over congested, narrow streets within the city. It satisfies a longstanding need for through-traffic in this industrial and commercial Piedmont section of the Carolinas.

North Dakota opened a 39-mile, four-lane divided Interstate highway between Jamestown and Valley City during the year. Included in the work were 35 major structures carrying the Interstate route over 2 rivers and separating it from 4 railroads and 17 crossroads.

In Oregon, over 9 miles of the Albany-Salem section of the Pacific Highway, Interstate Route 5, were recently opened to traffic. To produce this new facility in the Willamette River Valley, the existing two-lane highway was used as northbound lanes, and two southbound lanes, seven interchanges, and a new bridge over the Santiam River were added at a cost of $4.5 million.

In Pennsylvania, the Fort Pitt Bridge and the westbound sections of the Penn-Lincoln Parkway in downtown Pittsburgh were opened to traffic, making it possible to drive through the Golden Triangle without encountering any traffic lights.

In Rhode Island, the East Providence Expressway was nearing completion. In union with work currently underway in Massachusetts it will tie the cities of New Bedford, Fall River, and East Providence to the principal Maine-to-Florida Interstate Route 95 as it passes through Providence.

Interstate Route 90 northwest of Rapid City, S. Dak.

Texas Interstate Routes 35 and 20 intersect at this four-level interchange in Fort Worth.

South Dakota recently completed construction on 7 miles of Interstate Route 90 between Sturgis and Rapid City at a cost of less than $400,000 per mile. Traffic in this area, bolstered by the tourist attraction of the Black Hills, is expected to reach 5,800 vehicles per day in 1975. An additional 17-mile section including a spur into Rapid City was under construction.

Tennessee had more than 60 miles of construction underway on Interstate Route 40. Most of this work was in extremely rugged terrain between Knoxville and Nashville, where many deep cuts through solid rock were necessary.

In Texas, Interstate Route 35 from a point north of Dallas to the Oklahoma State line was moving rapidly toward ultimate development. The fiscal year saw completion, at a cost of $1.3 million, of the intricate interchange of Interstate Highways 35W and 20 in Fort Worth. This is a four-level facility providing direct connections for all through and turning movements. Over 100,000 vehicles are predicted to pass through this interchange daily in 1975.

In Utah, nearly 8 miles of Interstate Route 15 in the mountainous southwest corner of the State were under construction, to replace a portion of U.S. 91 which has a high traffic accident history. A dual six-lane facility with a forecasted 1975 daily traffic of 55,000 vehicles is being built on Route 15 in the northwest part of Salt Lake City.

Virginia completed its first Interstate section during the year on Route 95 west of Emporia in the southern part of the State. More than 6 miles of the same route were under construction north of Richmond at a cost of $2.2 million. This will be a six-lane, divided facility, with median widths varying from 64 to over 250 feet, built to carry an anticipated 70,000 vehicles per day in 1975.

In Washington, the Olympia Freeway, a 6-mile section of Interstate Route 5, was opened to traffic. This facility, designed for nearly 30,000 vehicles per day,

removes through traffic from the streets of Olympia and has reduced travel-time across the city from 25 minutes by the old route, to 7 minutes by the freeway.

In Wisconsin, the 24-mile section of Interstate Route 94 from the Illinois State-line northerly was nearing completion. The new road in this area replaces an obsolete four-lane divided highway, which lacked access control and had considerable ribbon development. One roadway was retained as a frontage road, and provided an efficient detour during construction.

Federal-Aid Improvement of Primary Highways

The Federal-aid primary highway system, as of December 31, 1958, comprised 260,170 miles of the principal highways of the Nation, and included 237,177 miles of main rural roads and 22,993 miles in urban areas. These mileages include the Interstate System, which by law is a part of the primary system.

Federal-aid primary fund authorizations, which may be used on either rural or urban portions of the primary system, have ranged upward in recent years from $247.5 million in fiscal year 1954 to $416.25 million for 1961. The funds for fiscal year 1960, amounting to $405 million, were apportioned to the States on August 1, 1958.

During the fiscal year 6,039 miles of improvements, estimated to cost over $822 million and involving nearly $434 million of Federal-aid primary funds were programed.

A recent primary project, near Bailey, Colo., removed a number of treacherous curves and steep grades on U.S. Route 285 through the Colorado Rockies. The basic two-lane section in this area was widened where necessary to provide for truck lanes and channelization of intersections.

Federal-aid assumes sizable proportions in the Caribbean as shown in this view of a recently completed primary project in Rio Piedras, south of San Juan, P.R.

Improvements involving Federal-aid primary funds were completed during the year on 7,135 miles of the Federal-aid primary system at a total cost of $781,422,900 of which $407,093,142 was Federal aid. The projects completed included 6,028 miles of bituminous and portland cement concrete surfacing, 1,174 bridges over streams, and 208 bridges over highways to provide traffic grade separations. In addition, railway-highway crossings were eliminated by construction of 128 grade-separation structures; 18 other structures were reconstructed; and 134 grade crossings were protected by installation of signal devices.

Some of the above work was made possible through the special "D" funds authorized by the Federal-Aid Highway Act of 1958 and described in a subsequent section of this report.

An increasing proportion of the Federal-aid primary system was being built as multilane, divided highways, some with partial or full control of access.

Federal-Aid Improvement of Urban Highways

Highways in urban areas eligible for improvement with Federal aid totaled 22,993 miles on the Federal-aid primary system and 11,059 miles on urban extensions of the Federal-aid secondary highway system. During the fiscal year 42 percent of all work programed on the Interstate System was for improvements in urban areas. This is commensurate with the Interstate System cost estimate study, which indicated that 44 percent of the total cost would be occasioned by such work. During the year, in addition to funds approved from the Federal-aid urban authorization, 8 percent of all primary highway funds was approved for urban highway work.

Rapid uninterrupted traffic service between Miami and Miami Beach is afforded by this new high-level bridge and its approaches constructed with Federal-aid urban funds. It replaces a narrow bascule bridge which was frequently opened for Intracoastal Waterway traffic.

During the past fiscal year plans approved for Federal-aid construction projects in urban areas totaled $1,625,228,036 and covered 1,277 miles of highway improvement. Of this total, $1,090,834,352 was Federal aid comprised of $235,608,387 from the urban authorization, $33,355,752 from the authorization for improvement of primary highways, $785,393,406 from Interstate funds, and $30,151,575 from the $400 million of special "D" funds authorized by the Federal-Aid Highway Act of 1958.

Including the special funds, Federal-aid construction work in urban areas completed during the fiscal year consisted of 1,193 miles of highway improvement costing $1,163,864,154 of which $741,593,739 was Federal aid. The completed work included 1,083 miles of bituminous and portland cement concrete surfacing, 228 bridges over rivers and streams, and 615 bridges to provide traffic grade separations between crossing highways. In addition to these structures, 110 railway-highway separation structures were completed, 12 existing structures were reconstructed for greater capacity, and 64 railroad grade crossings were protected by the installation of signal devices.

Secondary or Farm-to-Market Roads

The Federal-aid secondary network of farm-to-market, feeder, school-bus, and mail-route roads is the largest of the Federal-aid highway systems. The length totaled 554,953 miles as of December 31, 1958, including 11,059 miles of extensions into or through urban areas. The authorizations for this system were

$262.5 million, $270 million, and $277.5 million for the fiscal years 1959, 1960, and 1961, respectively.

In addition, $128 million of the special "D" funds authorized by the Federal-Aid Highway Act of 1958 were committed by the States for projects on the secondary system.

Including the special funds, a total of 21,317 miles of improvements, estimated to cost over $779 million and involving about $429 million in Federal-aid secondary funds, were approved during the fiscal year 1959. During the same period improvements were completed on 19,144 miles of the secondary system at a total cost of $556,669,418, involving $295,717,357 in Federal-aid secondary funds. Of the improvements completed, 11,964 miles involved bituminous or portland cement concrete surfaces, 5,251 miles were gravel or stone surfaced, and 1,846 miles were graded and drained preparatory to receiving surfacing. Also completed were 2,560 bridges over streams and 14 bridges over highways to facilitate the free flow of traffic; the completion of 31 new railway separation structures and the reconstruction of 2 others; and protection of 232 other railway-highway crossings by signal devices.

For the 14 years that Federal funds for the secondary program have been apportioned to the States, a total of 42,825 projects involving 171,347 miles of improvements had been completed (as of June 30, 1959). The projects have been widely distributed each year through an average of 2,000 counties, with an average of about 3,500 projects being completed each year.

The Federal-aid secondary program differs considerably from other Federal-aid highway programs. The system is not limited in length by Federal legislation. The only limitation is that mileage which can be properly constructed

A well-graded gravel road, built with secondary funds, serves the farming and livestock producing communities in Coffee County in south-central Tennessee.

and maintained in an individual county or State. The roads which make up the system are those which, in the opinion of State and county officials acting jointly, are of principal community importance. The selections are then subject to Public Roads approval. All projects must be selected cooperatively by the State highway department and local highway officials. Likewise, if the county contributes to the cost of construction or maintenance of a project, the State and county must cooperate in the determination of the improvement specifications.

Another difference is that under the provisions of the 1954 act the administrative procedure between Public Roads and the States in carrying out the secondary program has been simplified, with the States assuming greater responsibility. The new procedure is a voluntary one and at the end of the fiscal year 1959 all but Indiana, the District of Columbia, West Virginia, Alaska, and Hawaii had adopted it. (West Virginia subsequently adopted the plan effective July 1, 1959.)

In June 1959 the Board of County Consultants, a nine-man panel formed to advise in the formulation of policies affecting counties in the Federal highway programs, met with Public Roads officials in Washington. The Board, after nationwide consultation with State and county officials, expressed the opinion that there was general satisfaction with the prosecution of the secondary program.

Special Federal-Aid Authorization

The Federal-Aid Highway Act of 1958, in addition to the regular biennial authorizations of primary, secondary, and urban funds (the so-called ABC

Emergency "D" funds were used to construct two additional lanes on this thoroughfare bypassing the town of Plymouth in the South Shore–Cape Cod area of Massachusetts.

funds), provided $400 million to accelerate the highway program and stimulate the economy. (These funds are called "D" funds to differentiate them from the regular ABC funds.) The $400 million was apportioned to the States on April 16, 1958, using the ABC fund formulas, but the legislation provided that the money could be used without regard to the normal proportional distribution applicable to authorizations for the Federal-aid primary and secondary systems and their urban extensions. The act provided for matching of the "D" funds on a two-thirds-Federal, one-third-State basis, rather than the usual 50–50 basis, but with the customary adjustment for States having extensive areas of public lands. To aid the States in meeting up to two-thirds of their matching share, $115 million (so-called "L" funds) was also authorized as an advance. Funds thus advanced to the States are to be deducted in equal installments from the apportionments for the fiscal years 1961 and 1962. As required by the 1958 act, all of the "D" funds had been placed under contract by December 1, 1958, with the provision that construction must be completed by December 1, 1959

On June 30, 1959, $236 million of the $400 million of special "D" funds was obligated on primary projects for 5,857 miles of construction, $128 million for 6,040 miles of secondary projects, and $36 million for 231 miles of urban projects. These data are included in the statistics cited in the sections of this report dealing with Federal-aid improvements of primary, secondary, and urban highways. More detailed data, and a breakdown by individual States, can be found in tables 15 and 16 in the appendix.

Repair of Flood Damaged Roads

For many years it has been the policy of the Federal Government to aid the States in the repair or reconstruction of highways and bridges damaged or destroyed by floods or other catastrophes of extraordinary character and extent. Such aid is possible under an authorization permitting the use of available emergency funds without waiting for legislative action following each catastrophe. The Federal-Aid Highway Act of 1956 provided a continuing authorization of amounts not to exceed $30 million annually for this purpose.

During the months of July, August, and September 1958, and in January 1959, extraordinary rainfall in Iowa, Ohio, and West Virginia caused major flooding resulting in serious damage to highways. Flood damage in previous years also led other States to request allocations of emergency funds to assist in the reconstruction of damaged highways on their Federal-aid systems. Allocations of emergency funds totaling $3,278,094 were made during the fiscal year to six States for rehabilitation work estimated to cost $6,556,200. Amounts allocated were as follows: California, $1,521,907; Iowa $1,133,458; Ohio, $427,350; Oklahoma, $48,925; Mississippi, $26,294; and West Virginia, $120,160.

Highway Trust Fund

The Federal-Aid Highway Acts of 1956 and 1958 provided authorizations totaling $25,625 million for the fiscal years 1957 through 1969 for improving the National System of Interstate and Defense Highways. The legislation also provided authorizations for the fiscal years 1957 through 1961 for continuing the regular program of Federal-aid primary, secondary, and urban highway improvement. Under the provisions of the Highway Revenue Act of 1956, the highway program would be financed from revenue accruing to the highway trust fund established by the act.

Sources and amounts of income to the highway trust fund for the fiscal years 1957, 1958, and 1959 were as follows:

Item	Rate	Amount Millions
Gasoline and diesel fuels	3 cents per gallon	$4,766
Trucks, buses, and trailers	5 percent of manufacturing price.	252
Tires	8 cents per pound	618
Innertubes	9 cents per pound	
Tread rubber	3 cents per pound	36
Heavy vehicle use	$1.50 per 1,000 pounds gross vehicle weight.	93
Interest earnings		35
Total		$5,800

After deducting allowable refunds of $187 million for taxes paid on gasoline used for nonhighway purposes, a net total of $5,613 million was available for highways during the 3-year period. This total was $46 million greater than the original estimate of $5,567 million prepared in 1956.

Expenditures from the highway trust fund for Federal-aid highways totaled $966 million during the fiscal year 1957, $1,511 million during the fiscal year 1958, and $2,613 million during the fiscal year 1959, for a total of $5,090 million. On June 30, 1959, the unexpended balance in the fund was $523 million including $429 million in U.S. securities.

Under the provisions of section 209(g) of the Highway Revenue Act of 1956, the full amounts authorized to be appropriated for the Interstate System cannot be apportioned to the States if the estimated revenues to be placed in the highway trust fund will not be sufficient to defray required expenditures from the fund. The Federal-Aid Highway Act of 1958 suspended the limitations of this section for the 1959 and 1960 fiscal year apportionments and in addition provided increased authorizations for the fiscal years 1959, 1960, and 1961, as an antirecession measure and to keep the Interstate program on schedule.

Additional revenues were not provided, however, to cover the increased expenditures resulting from the 1958 act. As a consequence, it became evident that under existing legislation there would be a deficit in the highway trust fund beginning in the fiscal year 1960.

Congressional action was necessary to maintain a balance between trust fund revenues and expenditures. In keeping with the President's budget recommendation for the fiscal year 1960, draft legislation was submitted to the Congress providing for a temporary increase in Federal motor-fuel taxes from 3 cents to 4½ cents per gallon, to be levied during the fiscal years 1960 through 1964. Enactment of this legislation would avoid a deficit in the highway trust fund and permit apportionments of Interstate funds for 1961 and 1962 in accordance with authorized amounts. Action on this legislative proposal had not yet been taken on June 30, 1959.

In 1961 the Congress, with the benefit of two basic reports, covering a revised estimate of cost of completing the Interstate System and a study of the beneficiaries of the highway systems, will have the opportunity to study appropriate financing and scheduling of apportionments to complete the Interstate System as originally contemplated and to consider what continuing taxes should be imposed and the equitable distribution of such taxes for highway purposes.

The Federal-Aid Highway Act of 1956 and its companion Highway Revenue Act, and the Federal-Aid Highway Act of 1958, called upon the Secretary of Commerce to undertake a number of studies, in cooperation with the State highway departments, and report their findings to the Congress. Each of these reports was designed to provide extensive basic information and serve to guide the Congress in its consideration of the Federal role in highway improvement, use, and financing.

Accomplishment of the studies was delegated by the Secretary of Commerce to the Federal Highway Administrator. The first Interstate System cost estimate and the reimbursement study were submitted to Congress during fiscal year 1958 and were described in last year's annual report. Of the remaining studies, two were completed during fiscal year 1959; the others were underway. In addition to the work reported in the following paragraphs, much of the research described in the latter pages of this report was directly or indirectly related to these studies.

Progress of the Federal-aid highway program

Section 116(b) of the Federal-Aid Highway Act of 1956 directed the Secretary of Commerce to submit to the Congress, not later than February 1, 1959, a report on the progress made toward completion of the Interstate System in accordance with the stated objectives.

With the cooperation of the State highway departments, the Bureau of Public Roads collected the necessary data for inclusion in the report, "Progress Report on the Federal-Aid Highway Program" (H. Doc. No. 74, 86th Cong., 1st sess.), which was presented to the Congress on January 30, 1959.

Because of the dimensions and complexity of Interstate System projects, several years of planning, location, design, and right-of-way acquisition are required before actual construction can be undertaken. With this in mind, progress in the early stages of the program was measured in terms of funds obligated, actual construction, and the necessary preliminary steps.

By the end of calendar year 1958 about 12 percent or 4,831 miles of the Interstate System had been completed to standards and were at least adequate for current traffic volumes. Of this total, 4,701 miles were open to traffic. In addition, improvements had been completed on 2,665 miles or 7 percent of the total, but additional work was required to attain adequacy. Construction was underway or authorized on 3,967 miles or 10 percent of the total.

Right-of-way was available and surveys and designs were complete for another 342 miles. Such preparatory work was underway or authorized on an additional 16,501 miles or 41 percent of the total.

The work underway or completed at the end of the calendar year had a total estimated cost of $6.5 billion, including $4.8 billion of Federal-aid Interstate funds.

Of the 4,831 miles of the Interstate System completed to standards and at least adequate for current traffic, work on 1,622 miles had been accomplished with Federal-aid Interstate and matching funds, 2,213 miles were toll facilities, and 996 miles had been built with Interstate funds available prior to the 1956 act, with regular Federal aid, or with State or local funds.

Of the total mileage of Interstate routes designated in 1956, some 72 percent was planned for new locations. The remaining 28 percent included 6 percent of toll facilities built or being built on new locations. Thus, of the mileage studied, 22 percent was planned for construction along existing highways. The addi-

tional improvement needed in these areas ranged from acquisition of access control to complete reconstruction with only the existing right-of-way being salvageable.

Progress by individual States was not identical but it was not anticipated to be so in the early stages of the program. With the passage of the Federal-Aid Highway Act of 1956, some States were better prepared than others to avail themselves of the additional funds provided in the accelerated program. However, the States which have been behind the national average were rapidly closing the gap and it was reasonable to assume that they would continue to do so during calendar year 1959.

The major handicap to the prompt completion of the Interstate System appeared to be one of financing. The report therefore recommended that interim legislation temporarily increasing motor-fuel taxes be speedily enacted to provide funds to keep the progress of the Interstate System on schedule. (A more detailed account of the financial problem is included in the section under "Highway Trust Fund" and elsewhere in this report.)

Highway cost allocation study

The highway cost allocation study, required to be made by section 210 of the Highway Revenue Act of 1956, is for the purpose of providing Congress with information on the basis of which it may determine an equitable distribution of the tax burden among Federal-aid highway users and the other beneficiaries from improved Federal-aid highways. A "Third Progress Report of the Highway Cost Allocation Study" (H. Doc. 91, 86th Cong., 1st sess.) was presented to the Congress on March 1, 1959. An extensive first progress report covering background and plans had been made on March 1, 1957, and a brief second progress report was made on March 1, 1958.

The study, from the time of its inception in the fall of 1956, has been divided into seven major phases. The first of these, an assembly of information covering, for the study year 1957, all registered motor vehicles in each State, showing type of vehicle, annual use, fuel consumption, class of service, and tax payments, was completed in January 1959. Portions of this material were included in the third progress report. The data were more detailed, from the standpoint of distributions according to types and axle arrangements of vehicles, than related registration statistics that have long been published annually by Public Roads. For the special purposes of the highway cost allocation study the distribution of registrations geographically is according to Census Bureau divisions, rather than by individual States. In addition to arrangements of registrations according to types of vehicle and geographical areas, types and axle arrangements are reported according to kind of service and in 11 classes of registered gross weight.

The second phase of the study is a compilation by geographical areas of the estimated costs of bringing the several highway systems to certain stipulated standards of improvement. The work was substantially completed by February 1959, but will be subject to such subsequent adjustments as may be required when conclusions are reached on the proper length of program to be used in distributing the cost of improvement of Federal-aid systems other than the Interstate, and on what effect, if any, the preliminary findings of the AASHO Road Test may have on the estimates of needs as originally compiled by the State highway departments.

The third phase of the study is the preparation by each State of an estimate of traffic volumes and weights of vehicles on each highway system in 1957, classified by visual type, registered gross weight, type of operation, load on each axle, and by design hourly, or daily, traffic volume groups. Summariza-

tion of the data on vehicle-miles of travel, nationally and by Census division, was completed in February 1959. More recently, tabulations of weight data (axle and total operating weights according to registered gross weight groups) for each State and by Census divisions have been compiled and reviewed. The final correlation of vehicle-miles with operating weight for the years 1957 and 1964, the latter year having been selected early in the study as the year of projection for the cost and benefit analyses, was in process. Material from this phase of the study was published in the third progress report, including a comprehensive tabulation of vehicle-miles of travel according to urban and rural system and by visual types and axle arrangement of vehicles. Also included in the progress report were data on travel according to Census divisions and arrangements of vehicle-miles by systems according to design hourly and daily traffic volume groups.

The fourth phase of the study concerns the analyses of differential design, construction, and maintenance requirements for the various classes of vehicles, according to their size, weight, and frequency of occurrence in the traffic of each Federal-aid system. Upon these analyses will rest the actual assignment of highway cost responsibility. At the end of the year an intensive study had been completed by Public Roads engineers of data submitted by State highway departments concerning the incremental design standards and cost factors for road construction used in each State. This information, indicative of variations from State to State in geography and design practices, was used in the preparation of a tentative series of regional incremental designs for the 10 Census divisions of the country. These findings will be compared with preliminary results from the AASHO Road Test.

The fifth phase of the study is an analysis of the differential vehicular benefits that are expected to result from future improvements, under the authorized program, in highway surface, width, curvature, grade, capacity, etc. Processing of all available material was completed early in 1959. At the end of the year additional studies were being conducted that are expected to contribute substantially to the derivation of supportable monetary values for savings in time and for relief from annoyances or strain afforded by improved highway facilities. In progress also were additional studies on variation in rates of fuel consumption among various sizes and weights of vehicles under the same conditions of stop-and-go driving, and of variations in consumption rate within each size and weight group due to variations in type of roadway surface. The final computations for this phase of the highway cost allocation study have been tentatively scheduled for early summer of 1960.

The sixth phase of the study deals with the direct and indirect benefits from Federal-aid highways in addition to benefits from actual use. Last year 35 local studies were in progress, investigating the effects on the economy consequent to highway improvements. Fourteen of these studies have been completed but another 19 have been initiated so that there are now 40 such studies being conducted in 27 States. Five nationwide studies have been completed during the year and a new series of four studies was shortly to be undertaken. Some of the results of the more recent studies were the subject of a section of the third progress report, but at that time no conclusions had been reached regarding the relationship between these results and the assignment of benefits from highway improvements to other than the highway user.

The final phase of the cost allocation study will be the interpretation, analysis, and correlation of all of the phases just described, and the preparation of the final report. An electronic computer program had been completed for the application of findings from the incremental analysis (the fourth phase of the

study) to the data from the first three phases. A fourth report of progress is expected to be made on March 1, 1960. The final report is due in Congress by January 3, 1961.

Highway safety study

Section 117 of the Federal-Aid Highway Act of 1956 directed that a comprehensive study of highway safety be undertaken to determine what action by the Federal Government was necessary to promote this area of public welfare. During the past year, the study report, entitled "The Federal Role in Highway Safety" (H. Doc. No. 93, 86th Cong., 1st sess.), was completed and submitted to Congress by the Secretary of Commerce on February 27, 1959.

The report, which contains the results of 2½ years of intensive study, presents a complete account of our national safety picture. Included are the history of the highway safety movement, the scope and dimensions of the traffic accident problem, an evaluation of the various elements of highway transportation and how they contribute to accidents, and a survey of existing highway safety activities. The report is concluded with a description of an adequate program and recommendations for official action.

Although motor-vehicle traffic accidents ranked among the leading causes of death in the United States, an historical review showed significant advances in traffic safety in recent years. The alltime high of nearly 40,000 deaths in 1941 had not since been exceeded despite a doubling of the miles driven annually since that year. It was concluded in the report that steady gains in highway safety had been the result of many contributions, including safety education and driver training, safer vehicles, advances in highway and traffic engineering, more effective law enforcement, greater uniformity in traffic laws and ordinances, increased public consciousness of the importance of highway safety, and stronger public support of official activities in the field of safety. Several special projects, undertaken for this report, are described in the following paragraphs.

In cooperation with 11 selected States, a study was made of the relative involvement of certain driver and vehicle characteristics in motor-vehicle accidents. The field work included almost 300,000 driver interviews and the analyses of 10,000 accident involvements on 35 sections of main rural highways. Accident involvement rates were obtained for the first time for items such as age, sex, and residence of drivers, and speed, horsepower, age, and type of vehicle. Findings of this study indicated, for example, that high (but not excessive) speeds on adequate rural roads were actually less dangerous than low speeds; that vehicles with higher horsepower were involved in fewer accidents than low-powered vehicles, and that younger drivers had the worst involvement rates.

At Northwestern University an interdisciplinary team, composed of engineer, medical, and behavioral scientists, had begun work on an unusual 3-year accident research project. Actual at-the-scene investigations of selected accidents were made by the team, along with subsequent interviews and studies, to obtain extensive data concerning the cause of the accident from the standpoint of each specialist. Results of the first year of research, included in the safety study report, showed that road deficiencies and detrimental social interactions within the vehicle were more prevalent in accidents than had previously been supposed. Early work has shown promise of other important findings and has also contributed to a better understanding of the significant problems in the methods and equipment used in this new study technique.

A critical survey of two communities with similar general characteristics but different traffic safety records was performed by human behavioral consultants. In extended, unannounced visits to these cities, various social and community influences were identified as ones which may have contributed to the difference

in their respective records. Among the interesting qualities of the community with the better safety record, in addition to a better traffic safety program, were a less dense population, slower rate of growth, lower median income, less competitiveness, crime, and general activity and hence a lower level of aggression and conversely a more friendly atmosphere. Also involved were narrower, steeper, and more winding streets and what might be called driver restraining topography, and less traffic density.

Intensive study of a large sample of individual accident reports in a selected State resulted in the development of a comprehensive data classification system to accomplish the maximum amount of use of information that is contained in individual reports. Previously the compilation of potentially valuable descriptive, narrative, and diagrammatic information had been desired, but had not been successfully accomplished.

A review and analysis of highway safety activities within the Federal Government showed that at least 16 agencies had programs that reached the general public and that some are engaged in many and varied activities. Most noticeable in this survey was the lack of working liaison and formal coordination among the groups.

The conclusions of the highway safety study were that existing overall programs were basically sound, although many specific elements were in need of considerable modernization and reevaluation, that some current beliefs concerning accident causes cannot be soundly defended, and that direct Federal intervention into the operation of official State and local safety programs was not feasible.

In its principal specific recommendation, the report proposed the establishment of a Federal Interdepartmental Highway Safety Board to coordinate and guide the efforts of the various agencies engaged in highway safety at the Federal level, to support and assist the States and communities as needed in the conduct of their official programs, and to provide an official national focus for highway safety that is not now in existence.

Forest highway study

Although progressive improvements have been made on the forest highway system through the cooperative efforts of the States, the counties, and the Federal Government, a large percentage of the system mileage is still inadequate for present-day and future traffic requirements. A study of the system and the preparation of an estimate of the needed improvements was underway during the past year, initiated in accordance with the requirements of section 3(b) of the Federal-Aid Highway Act of 1958. The responsibility for the study rests with the Secretary of Commerce, working cooperatively with the Secretary of Agriculture and the several States and Puerto Rico, wherein the national forests are located. The results of the study are to be reported to the Congress by January 1, 1960.

The forest highway study was divided into four phases. The first of these consisted of the selection of roads of primary importance located within, adjoining, or adjacent to the national forests which met the qualifications of forest highways but were not so designated. The second phase constituted a detailed study to determine the needs of all roads presently on the forest highway system, as well as the needs of those roads selected in the first phase. These first two parts of the study were completed prior to the end of the fiscal year. The third phase involved the formulation of construction and maintenance programs for each of the 10 fiscal years 1962–71, inclusive. The development of these programs was well advanced at the close of the year. The fourth and final phase of the study requires the determination of a method for apportioning funds

necessary for the financing of the 10-year program. This final step was, of necessity, delayed until completion of the program phase.

Maximum desirable vehicle sizes and weights

Section 108(k) of the 1956 act directed the Secretary of Commerce to make recommendations to Congress with respect to maximum desirable dimensions and weights for vehicles operated on the Federal-aid highway systems. The report is due in January 1961. In recognition of the responsibility and prerogative of the States in this matter, Public Roads sought the assistance and cooperation of the American Association of State Highway Officials to bring conformity between the recommended limits and the policy standards of the association.

An extremely important element in the derivation of such recommendations will be the results of the AASHO Road Test, in which Public Roads is participating. Progress on this complex test is described elsewhere in this report.

Public Roads, in connection with the purpose of section 108(k), was also working on an extensive study of the economics involved in the road-vehicle relation. The work is described in this report in the section on "Traffic Operations Research."

Highway Improvements Under Direct Supervision of Public Roads

Under existing legislation, the Bureau of Public Roads receives and administers directly annual appropriations for major highways through national forests, and performs highway engineering and construction services for other Federal agencies as required by law and as may be requested for specific projects. The principal agencies receiving direct appropriations for the construction and maintenance of roads, and requesting assistance from Public Roads, include the Departments of Agriculture, Defense, and Interior. The Bureau has also directly supervised all Federal-Aid highway construction work in Alaska since the passage of the Federal-Aid Highway Act of 1956, which made Federal-aid funds available to that area for the first time.

During the past year, the engineering and construction services of Public Roads were used on a greater volume of highway improvements than ever before. Improvements under the direct supervision of Public Roads were completed on 186 projects, covering 1,044 miles and involving Federal funds totaling over $54 million. The following tabulation indicates the magnitude of highway work in which Public Roads' engineering and construction services were actively engaged at the close of the fiscal year (the figures include estimated costs of work in the program, plans approved, advertised, and/or construction stage):

Forest highways [1]	$62,281,440
Alaska Federal-aid projects	22,193,488
Parkways	26,102,373
Park roads	13,472,383
Woodrow Wilson Memorial Bridge [2]	11,256,353
Bureau of Land Management roads	8,721,119
Forest development roads	8,265,962
Department of Defense, access roads	1,767,123
Federal Lands highways	1,571,800
National Science Foundation, Kitt Peak observatory road	970,874
Bureau of Indian Affairs, Indian reservation roads	399,160
Miscellaneous reimbursable construction	134,500
Total	$157,136,575

[1] Excludes forest highway construction under State supervision.

[2] Across the Potomac River below Washington, D.C.

A brief coverage of the more significant activities under the direct supervision of Public Roads is presented in the following paragraphs.

Forest highways

The forest highway system, which is composed of main and secondary roads within or adjacent to the national forests, had a total length of 24,566 miles at the close of the fiscal year. It is located in 40 States (including Alaska), and in Puerto Rico. Although the system is not a wholly connected system, as is the case of the Federal-aid primary highway system, its routes are the principal means of land transportation into and through these forest areas. A great portion of the transcontinental traffic across the Continental Divide in the Rocky Mountain area of the West, and the interstate traffic over lesser mountainous barriers in other areas, move via forest highways. Approximately 84 percent of the forest highway system mileage coincides with the Federal-aid primary and secondary systems. Table 19 of the appendix shows the total system mileage by forest road class and by State.

Approximately 83 percent of all construction completed on the forest highway system during the past fiscal year was under the direct supervision of Public Roads. This work covered 312 miles of forest highways and involved Federal funds totaling $19,139,000. At the close of the year, 512 miles (similarly supervised) were under construction involving Federal funds estimated at $34,548,000.

Typical of forest highway construction was the work performed on the Trinity River Highway in California. The final grading project on the 10-mile section from Berry Summit to Willow Creek was completed in the fall of 1958. The terrain through which this route passes is steep and unstable, and throughout construction, which began in 1952, slides and poor drainage conditions presented constant problems. A plant-mix surfacing, 28 feet wide, was placed in 1959, bringing the total construction cost to $3,950,000. This route, in addition to serving both the logging industry and traffic to recreational areas, is the direct route from the coast to the central valley of California.

Considerable construction activity also took place on the Mount Rose Highway in Nevada. Twelve miles of grading work was scheduled for completion in the summer of 1959, to be followed by placement of plant-mix surfacing 26 feet wide. This will complete the 23-mile route to modern alinement and grade. The Mount Rose Highway is a spectacular route reaching a maximum elevation of 8,900 feet. It serves Reno-Lake Tahoe traffic which is principally recreational, and will accommodate traffic generated by the 1959–60 Winter Olympic Games at Squaw Valley.

Substantial improvements on the highway between Regina and Coyote in north-central New Mexico were also underway. A 24-mile section between these termini is located within the Santa Fe National Forest and is coincident with State Route 96. This route serves the stock raising, farming, and lumbering activities in the adjacent valleys. Recent construction has provided a much needed improvement over the road which previously was frequently impassable because of mud, resulting in the temporary closing of schools in the area. A 6-mile grading project near the west end of the route was completed just prior to the close of the year. The program for next year includes placing a bituminous stabilized base over the greater portion of the route.

The construction and maintenance of forest highways in Alaska continued under the direct supervision of Public Roads as heretofore. The principal construction projects started during the year included the extension of the Mitkof Highway south of Petersburg (an eventual link with the Canadian highway system), improvement of the Glacier Highway north of Juneau, recon-

struction of a portion of the Copper River Highway between the town of Cordova and the Cordova Airport, and improvement of the Portage Glacier road. During the year, grading was completed on a 5-mile section in the Tongass National Forest at a cost of about $600,000. At the close of the year construction was underway on 19 miles at an estimated cost of about $3 million.

Federal-aid construction in Alaska

The Bureau of Public Roads, in addition to discharging its usual administrative responsibilities, continued to perform the general functions of a State highway department in maintaining the Federal-aid construction program in Alaska. This service included location surveys, design, contract administration, construction supervision, and highway maintenance. The Federal-aid highway system in Alaska (as of June 30, 1959) was 5,356 miles in total length, including 2,195 miles on the primary system and 3,161 miles on the secondary system. During the year, new construction or improvements were completed on 279 miles of the Federal-aid system at a cost of $8,280,000. At the close of the year, construction work was underway on 165 miles at an estimated cost of $20,132,000.

One of the more important projects started during the year will complete bituminous surfacing of the last 70-mile section of the Alaska Highway within the boundaries of the State. Also of importance was the completion of construction of the primary route between Fairbanks and Nenana, though direct access to the town of Nenana is presently restricted to the winter months when the Tanana River can be crossed on the ice.

Federal aid for highways in Alaska was available during the fiscal year for the last time under the unique provisions of the Federal-Aid Highway Act of 1956, which first extended this program to the Territory of Alaska on a 10-percent matching basis. Alaska achieved statehood status on January 3, 1959, and on June 25, 1959, the Alaska Omnibus Act was signed into law conferring full responsibility for the Federal-aid highway program to the new State on a basis comparable to that of the other States. Under the terms of the 1956 act, Federal-aid and matching funds have totaled approximately $14.5 million annually, and were available for use either for construction or for highway maintenance purposes. The Federal-aid allocation for fiscal year 1961 will approximate $37 million with the State participating in accordance with the normal formula. Maintenance costs will be assumed entirely by the State.

Alaska will not immediately assume full responsibility for the administration of the Federal-aid construction program. Under the terms of a contract effective July 1, 1959, the Bureau of Public Roads will continue to construct projects on the Federal-aid highway system in Alaska, maintain highways on this system, and perform all other necessary functions in connection therewith as heretofore, and in accordance with Federal-aid regulations and procedures applicable to Alaska. These functions are to be assumed by the State not later than June 30, 1964.

National park highways, park approach roads, and parkways

The construction or improvement of highways within or approaching national parks or monuments, and of parkways specifically designated by legislation, is financed by funds appropriated to the Department of Interior. These funds are administered under regulations jointly approved by the Secretary of Interior and the Secretary of Commerce. The Bureau of Public Roads collaborates with the National Park Service of the Department of Interior in establishing systems and developing annual programs. Public Roads engineers make surveys, prepare plans and specifications, and supervise the construction of projects on major roads.

Hairpin turns are still useful in negotiating the steep grades entering Arches National Monument in Utah.

During the fiscal year, improvements were completed on 274 miles of park roads and parkways, involving Federal funds totaling $20,321,881. At the close of the year, 254 miles of improvements were under construction involving Federal funds totaling $37,737,220. Table 20 of the appendix indicates the general locations of this construction activity. Some typical improvements are briefly described in the following paragraphs.

Blue Ridge Parkway.— During the past year, 13 projects were completed on 83 miles of this parkway in Virginia and North Carolina at a cost of $4.1 million. The work included tunnel construction, bridges, grading, base course, and surfacing. Four new projects were let to contracts totaling $2.3 million for tunnel work, a grade-separation structure, 8 miles of grading, 6 miles of bituminous surface treatment and 13 miles of bituminous concrete pavement. At the close of the year, construction was underway on 83 miles, involving Federal funds totaling $11.9 million. The James River Bridge is scheduled for completion late in 1959. The surfacing on the sections between U.S. 60 and Virginia State Route 130 just north of the James River had progressed sufficiently to permit limited use of the parkway in this area. It was anticipated that the grading and base-course construction between U.S. 220 and Adney Gap, in the vicinity of Roanoke, will be completed during the 1959 construction season. A contract was let near the close of the fiscal year for constructing a bituminous concrete pavement near Deep Gap and Blowing Rock, N.C. The completion of this work will provide a continous section of 162 miles of parkway from Adney Gap in Virginia to a point near Grandfather Mountain in North Carolina. Grading and base-course construction was also underway on the last portion of the section between Beech Gap and Balsam Gap south of Asheville, N.C. The completion of this work and similar work previously let to contract will permit the opening of 56 miles for limited use at the southerly end of the parkway which terminates at Ravensford.

George Washington Memorial Parkway.—This parkway lies along both sides of the Potomac River, in the vicinity of Washington, D.C. On the Virginia side of the river, all bridge construction and parkway surfacing for an extension to the location of the new office building for the Central Intelligence Agency was

nearing completion at the close of the year. It was anticipated that this section of the parkway will be open to traffic in the fall of 1959. At the close of the year, a contract was let for the widening and surfacing of a short section of the parkway north of the Washington National Airport. On the Maryland side of the river, a 3.9-mile grading project north of the District of Columbia was substantially complete at the close of the year. Two new projects for 4.3 miles of grading were let to contract totaling $2.3 million.

Natchez Trace Parkway.—During the fiscal year, 9 contracts, involving 16 bridges and 22 miles of grading and base-course construction, were completed on this parkway located in Alabama, Mississippi, and Tennessee. Other projects involving Federal funds totaling $7.2 million were underway on 77 miles at the close of the year. Several of these will be completed during the 1959 construction season. Contracts were let during the year for the construction of five bridges, 8 miles of gravel base course, and 12 miles of bituminous surfacing. A contract was also let to a consulting engineering firm for the design and preparation of plans, specifications, and estimates for a bridge to carry the parkway over the Tennessee River.

Yosemite National Park.—A 20-mile section of Tioga Road, the east-west crossing of this California park, was being graded to modern alinement. Grading was started in July 1957 and was expected to be completed early in the fall of 1959. A contract for paving this section was scheduled for letting in the summer of 1959. These projects will replace, at a cost of about $3.7 million, a section of one-way, unimproved, and hazardous road that for many years has carried moderately heavy traffic during the summer months.

Mount McKinley National Park.—During the past fiscal year work was initiated on a program to improve the main route through Mount McKinley Na-

A prestressed concrete bridge carrying the Blue Ridge Parkway south of Roanoke, Va.

tional Park in Alaska to modern standards. Advent of statehood and completion of the Denali Highway, providing highway access to the park for the first time, has resulted in a sharp increase in visitors and an urgent need for adequate roads. During the fiscal year reconstruction of the first 10-mile section from the park entrance west to the Savage River was underway. In addition, a new bridge was built, another bridge was under construction, and dikes and revetments were constructed at several locations where flood damage had occurred. At the close of the year, three projects were under construction with contracts totaling $1,232,000. Public Roads forces performed highway maintenance in the park on a reimbursable basis.

Woodrow Wilson Memorial Bridge

The Woodrow Wilson Memorial Bridge, crossing the Potomac River near Alexandria, Va., was being built under a Federal appropriation of nearly $15 million and under the direct supervision of Public Roads. The structure will be 5,900 feet long and when complete, will serve as the predominant link in the southern portion of the Washington circumferential highway.

During the year six contracts were let, totaling nearly $11 million. The work involved the construction of a hydraulic embankment and the construction of piers, fenders, and substructure steel work for the channel spans, and the substructure and superstructure for the west and east approaches.

Bureau of Land Management roads

Public Roads continued its cooperation with the Bureau of Land Management of the Department of Interior, in its program of road construction in Oregon, by preparing plans and supervising the construction of roads providing access to logging areas. During the year, construction was completed on 26 miles at a cost of over $1.6 million. At the close of the year, 105 miles were under construction at an estimated cost of $4.3 million. As the roads constructed by Public Roads, and the feeder roads constructed by logging companies, are not on a county or State road system, necessary maintenance operations are performed by Public Roads as requested by the Bureau of Land Management. During the past year Public Roads maintained 188 miles of roads which were constructed under its supervision, and 251 miles of feeder roads constructed by others, at a cost of approximately $380,000.

Forest development roads

Public Roads, at the request of the Forest Service, makes surveys, prepares plans, and supervises the construction of roads within national forests which are of primary importance in the protection, administration, and utilization of the forests; or which are necessary for the use and development of the resources upon which the communities within or adjacent to the national forests are dependent. During the past year, 70 miles of such roads were completed involving Federal funds totaling $4.62 million. At the close of the year, 108 miles were under construction at an estimated cost of $6.9 million.

Indian reservation roads

In accordance with an agreement with the Bureau of Indian Affairs, Public Roads continued to provide general supervision for the programing, design, and construction of roads and bridges in Indian reservations. During the past year, under direct supervision of the Bureau of Indian Affairs, 901 miles were programed or under construction at an estimated cost of $16,762,000. In addition, 6 miles were completed under the direct supervision of Public Roads at a cost of $93,719, and plans approved for the construction of 9 more miles at an estimated cost of $399,200.

Kitt Peak observatory road

The National Science Foundation has chosen Kitt Peak (located in the Quinlan Mountains, 40 miles southwest of Tucson, Ariz.) as the site for a major optical astronomy observatory. The observatory was being designed and constructed by the National Science Foundation and when completed is expected to be the world's largest. A 13-mile access road and an adequate parking area at the summit will be constructed under the direct supervision of Public Roads at an estimated cost of $2,890,000. Of this amount, $1 million was made available to Public Roads by the Independent Offices Appropriation Act of 1959. During the past year, an aerial survey of the proposed route was completed and topographic maps were developed for use in preparing construction plans. This observatory, located entirely within the Papago Indian Reservation, will undoubtedly become a major attraction to tourists. An estimated 30,000 visitors are expected annually.

Defense access, replacement, and maneuver road program

At the close of the fiscal year only four of the many access roads financed with Atomic Energy Commission funds and serving uranium mines remained to be completed.

During the year, funds transferred to Public Roads by the agencies of the Department of Defense for highway projects serving defense installations included $1,766,330 from the Department of the Army, $3,196,613 from the Department of the Navy, and $5,452,879 from the Department of the Air Force. This increased the total funds transferred by these departments since the beginning of the program to $50,324,797. The National Aeronautics and Space Administration also transferred $75,000 to finance preliminary engineering and right-of-way for one project. The total of all transfers made available for defense access, replacement, and maneuver roads since the beginning of the Korean emergency amounted to $110,687,420.

During the fiscal year, 57 projects serving defense installations were completely financed at a total estimated cost of $8,672,744, of which $8,223,429 was provided by the Department of Defense. Preliminary engineering and right-of-way costing $705,628 was programed on 17 additional defense projects having a total estimated construction cost of $6,616,560. At the close of the year, 41 projects having a total estimated cost of $20,318,120 and requiring $19,089,934 of defense access-road funds had been certified as important to the national defense or referred to the Department of Defense for certification. The Bureau of Public Roads was evaluating 85 other projects.

Some of the projects under study or in various stages of construction were those serving facilities at Redstone Arsenal, Huntsville, Ala., Cape Canaveral Missile Test Center and Patrick Air Force Base in Florida, the Naval Missile Facility at Point Arguello, Calif., and many ICBM sites in the vicinity of established airbases.

Public lands highways

For a number of years public lands funds have been made available for construction and maintenance of main roads through unappropriated or unreserved public lands, nontaxable Indian lands, or other Federal reservations, on the basis of need. After evaluating several proposed projects, the $3 million authorized for the fiscal year 1960 was allocated to eight projects in eight States. One of the larger of these was the development of a road along the rugged and scenic route followed by the Lewis and Clark expedition in Idaho near the Montana border, from the Lolo Pass westerly. Federal-aid primary, forest highway, and public lands funds had previously been expended on improvement of this route.

Highway Design

Public Roads engineers worked closely with the State highway department engineers to resolve the many difficult problems of highway design, particularly on the Interstate System and in urban areas, and to disseminate proven, good practices throughout the Nation. Continued emphasis was being placed on the design of divided highways as separate one-way roadways to provide interesting, safe, and economical highways, on the use of appropriate interchange types, and on the proper placement of interchanges along the freeway routes to protect the operational efficiency of these high-cost highways and to provide also for adequate local service where feasible.

Staff engineers assisted in a series of regional seminars on freeway operations, focusing attention on those phases of location and design that are directly related to safety and efficiency of operations, both on the freeway and on the connecting roads and streets.

Pavement design

In cooperation with the AASHO Operating Committee on Design, Public Roads engineers continued work on the preparation of a projected handbook on pavement design. The handbook will cover the basic aspects of pavement design as well as practical methods of evaluating traffic, supporting power of soils, and strength of pavement structure. A corollary to the preparation of the handbook is the development of a formula for pavement thickness that can be universally applied. Data obtained from the AASHO Road Test will be used in developing the formula.

Design policies

As a result of joint work by Public Roads and the American Association of State Highway Officials, two new policies were developed and adopted: "A Policy on Fencing Controlled Access Highways" and "A Policy on Locating Police Stations and Maintenance Yards Serving Interstate Highways." Both were published by the AASHO. The policy on fencing will promote economy in constructing and maintaining the Interstate System by clarifying conditions under which fencing is unnecessary, and will enhance the safety aspects of the system by describing conditions where a fence is desirable from the safety standpoint, and should therefore be provided. The policy on locating police stations and maintenance yards requires that these installations be located on crossroads in the vicinity of interchanges and not on the controlled-access facility. The requirement is in the interest of safety to police and maintenance personnel as well as to the motoring public.

Similar design development work was underway, but not completed, on the policies for treatment of utilities, lighting and U-turn median openings on the Interstate System, and on driveway connections to trunk highways.

For a number of years, Federal-aid highway funds and regular Federal-aid procedures have been used to develop to modern standards those Federal-aid routes which had been replaced in kind on new location due to the construction of water projects, such as those for flood control or irrigation, under the jurisdiction of the Bureau of Reclamation and the Corps of Engineers. During the fiscal year several water projects were initiated by the Corps of Engineers, who were to be responsible, under agreements with the States, for the survey, design, and construction of replacement roads. These will now include such betterments as may be necessary to improve the facility to modern standards.

Numerous problems have developed as a result of locating Interstate highways, with their control of access feature, across existing and contemplated irrigation projects. These problems involve not only provision for the move-

ment of water across the Interstate highway but the movement of ditch-cleaning equipment and ditch riders. The Bureau of Public Roads held several conferences during the fiscal year with the Bureau of Reclamation to resolve these matters on an equitable basis without delaying the development of the Interstate System. It was expected that an agreement on policy will soon be reached which will serve as a guide to the State highway departments in the design of Interstate highways through lands reserved for irrigation projects by the Bureau of Reclamation.

Economic results of engineering design review

Conventional highway designs, the product of sound engineering judgment and experience, are constantly under surveillance by engineers of Public Roads and the State highway departments, to detect those areas where the "normal" or routine approach can be modified, in the interest of economy and at no expense to the safety, comfort, and convenience of the traveling public. The efforts of Public Roads engineers to assist the States in this direction, during the design stages of Federal-aid projects, are evidenced by an estimated savings of nearly $55 million accomplished in fiscal year 1959. Examples of the types of savings follow.

After detailed review of some Interstate and other trunk routes in three States, it was found possible to reduce the frequency of interchanges and separation structures and to simplify other interchange ramp designs, resulting in savings of more than $3 million.

Savings were made in bridge design by substituting open-end spans and cellular or spillthrough abutments for massive, gravity-type abutments. Over $1 million was saved on one project by the introduction of a double-decked bridge in place of a wider, single-deck structure.

Although it has always been difficult to attain a balance between cuts and fills on any one project, careful scheduling of adjacent projects may achieve such a balance. Reduction of waste and borrow quantities by this means saved more than $350,000 in one State alone.

The use of refined planning, location, and design techniques brought about the realinement of one section of an Interstate route, reducing the length by 1.2 miles and the construction cost by $350,000.

Other savings resulted from judicious use of a variable median, anticipation of construction problems which might otherwise have occasioned costly changes during construction, and the elimination of expensive construction items of relatively negligible benefit to the public.

The $55 million discussed in these paragraphs is a reduction in actual project cost and will be reflected in additional highway construction urgently needed in the States where the savings were effected. To this figure must be added the extensive benefits to the highway user which continually result from improved design.

Bridge Design

Public Roads has continued its cooperation with the State highway departments and industry in the development of better methods and improvements in bridge design and construction. Progress was made in revising and enlarging the publication "Standard Plans for Highway Bridge Superstructures" which was last issued in 1956. Longer spans will be added for some of the bridge types and new types will be introduced.

In view of recent accidents involving automobiles in collision with bridge railings, Public Roads has recommended the use of concrete parapet rails ex-

tending 18 inches above the top of the safety curb wherever practicable. The AASHO Bridge Committee has been asked to reexamine bridge rail design specifications with the expectation that a change therein will result.

A "Catalog of Highway Bridge Plans" has been published, listing designs for various types and span lengths of steel and concrete structures which the State highway departments have prepared and have on file. The quantities of steel and concrete required for the various types of structures are shown graphically. The catalog was furnished to all State highway departments to facilitate the exchange of bridge plans on a national basis.

Considerable progress in the field of procurement, analysis, and design use of project valuation data has resulted from the cooperative efforts of Public Roads and State highway bridge engineers. A guide manual, entitled "Some Practical Aspects of Foundation Studies for Highway Bridges," was prepared.

A specification for a new low-alloy, high-strength carbon manganese steel has passed through the technical committees of the American Society for Testing Materials and was in the hands of the Society for approval. This new specification, if adopted, will greatly facilitate the specifying of high strength steel for riveted bridges.

Cooperation continued with the American Welding Society in the revision of the current specifications for welded highway bridge construction, and with the Steel Structures Painting Council which is conducting research in both the laboratory and the field. Public Roads is participating in research projects in structural problems being conducted by the University of Arkansas, Cornell University, the University of Florida, the University of Illinois, Lehigh University, the University of Missouri, Northwestern University, Texas A. & M. College, and the University of Washington. These research projects are on prestressed concrete, high-strength steel bars for concrete reinforcement, welded plate girders, riveted and bolted joints, and experimental bridge truss behavior.

Right-of-Way Acquisition

In furtherance of Public Roads' objective of improving the Federal and State procedures and expediting the acquisition of rights-of-way for the Federal-aid program, additional appraisers have been employed in many of the division and regional offices and additional legal personnel have been employed by the office of the General Counsel. Two right-of-way seminars were conducted during the year for the purposes of further indoctrinating and training Public Roads right-of-way personnel. Through cooperation with the State highway departments it has been possible to create a better understanding by Public Roads, State, and independent appraisers of the appraisal and legal problems that are peculiar to and inherent in the acquisition of rights-of-way for highway purposes.

In a number of instances, at the request of the States, Public Roads has acquired rights-of-way by Federal condemnation for the use of the States in constructing the Interstate System and defense access roads, when the States have not been able to secure such rights-of-way with sufficient promptness. Public Roads has in many cases assisted the States in securing rights-of-way for highway purposes across lands owned by the United States, and under the jurisdiction of various departments and agencies.

Highway Roadside Improvement

A guide for showing roadside improvements on project plans, based on current desirable practices, to encourage better planning of roadside work in highway programs, was completed during the year. Cooperative work was continued with committees of the American Association of State Highway Officials toward

formulation of a policy on landscape development for the National System of Interstate and Defense Highways. Preparation was begun on a series of guide standards to assist the States in the application of the policy, based on selected examples of landscape development in all regions.

During the fiscal year Public Roads cooperated with the State highway departments and manufacturers in the development of chemicals and equipment for application in the control of weeds, brush, and poisonous plants on highway rights-of-way. Reduction in highway maintenance expenditures has resulted from the increased use of chemical sprays. The continued research and development of this means of controlling roadside vegetation give promise of replacing or reducing the expensive mowing and cutting methods used in the past.

Cooperation with research and educational institutions has continued during the year on the abatement of noise with special reference to highway design.

Public Roads specialists cooperated with the American Association of Nurserymen in revision of the "American Standard for Nursery Stock," published in March 1959 by the American Standards Association. This standard is in use by many of the State highway departments as a part of the specifications covering materials used in highway planting in all regions.

Use of Aerial Surveys

In their efforts to handle the expanded highway program with modern techniques, most of the State highway departments were employing aerial surveys and photogrammetric methods of mapping in their highway location and design work. Many of the States were continuing to contract for photogrammetric engineering services. Other States had set up separate units to perform such services with their own forces: Some had purchased aircraft and were equipped to take and to use aerial photographs for reconnaissance surveys; others have added photogrammetric instruments for compilation of large-scale preliminary survey topographic maps and for measurement of profile and cross sections; a few were equipped with photographic laboratory equipment and photogrammetric instruments to perform their photogrammetric work with aerial photographs obtained by contract. Much of the preliminary survey mapping and measuring accomplished by photogrammetric methods was geared to utilization of electronic methods of computation in design and preparation of construction plans.

Public Roads staff specialists continued to review principles of photogrammetry and to develop the general techniques, to disseminate information as to methods and fields of use, and to assist the States in their proper application. For other Federal agencies and for several States on Federal domain projects, Public Roads also made a series of highway reconnaissance surveys and accomplished topographic mapping for highway location and design purposes. Such work served both the needs of specific projects and as demonstration examples of special or general methods.

A wide variety of training courses was provided for engineers within the Bureau, for State highway personnel, and for representatives of foreign highway agencies. As circumstances required, these varied from individual training of several months to group courses of 1 to 5 weeks. About 130 engineers received such training during the year.

The publication "Reference Guide Outline—Specifications for Aerial Surveys and Mapping by Photogrammetric Methods for Highways" was revised and published during the year.

Geodetic Markers for Survey Control

The Federal-Aid Highway Act of 1956 authorized the participation of Federal-aid highway funds in the establishment of geodetic markers in accordance with the specification of the U.S. Coast and Geodetic Survey. Seventeen States have initiated projects, including five projects begun during the fiscal year, for the establishment of geodetic markers on 7,405 miles of the Interstate System.

Emergency Planning and Mobilization Readiness

In a national emergency the Bureau of Public Roads has the responsibility either directly, through the respective State highway organizations, or otherwise, to preserve in operable condition the entire available highway network of the Nation.

Much progress has been made during the past year in defining the precise duties which Public Roads and the State highway departments would be called on to perform in the event of a national emergency caused by an enemy attack.

Based on this definition of duties, procedures developed for the performance of such tasks were reviewed by the Emergency Planning Committee of the American Association of State Highway Officials and used, for purposes of testing in Operation Alert, 1959.

During the year, extensive and continuing programs were effected to bring to Public Roads' field organization and the State highway departments, detailed information regarding the emergency plans of the Bureau. As part of this program, meetings were held in each regional office for exposition and discussion of the problems anticipated in an emergency and the procedures that could be used to solve them.

In cooperation with the American Association of State Highway Officials, Public Roads continued its efforts to develop a greater coordination of emergency planning, at all levels of government, as it affects highways and highway transportation.

Disaster assistance

During the past year unusual floods inflicted serious damage to roads, streets, and bridges, causing the President to declare major disaster areas in Indiana, Iowa, Kansas, Missouri, North Carolina, Ohio, Oklahoma, Pennsylvania, and Texas. Field personnel of the Bureau of Public Roads assisted these States by assuming the professional leadership necessary in areas of offsystem road damage, and by providing technical guidance to the Office of Civil and Defense Mobilization and State and local governments in determining eligible work and establishing uniform operating procedures. Use of emergency funds for repair of flood-damaged roads is discussed elsewhere in this report.

Highway Safety

The Bureau of Public Roads was actively engaged in the study and promotion of highway safety during the year. A report of the highway safety study, conducted at the request of Congress, was completed during the fiscal year. The study report, and a variety of research studies of vehicle and driver performance conducted by Public Roads and aimed at the development of safe highway design, are described in other sections of this report.

The Highway Safety Study unit has been continued as a special activity of the Bureau of Public Roads with responsibility for the study and investigation of highway safety throughout the United States and the coordination of safety research and other highway safety programs in the Bureau.

Public Roads continued to cooperate closely with the President's Committee for Traffic Safety, providing part of the staff and financing. In cooperation with the Council of State Governments, the Committee sponsored four regional traffic-safety seminars for legislators during the year. In attendance were 141 legislators and 38 others including legislative service representatives.

As the year ended, plans were in progress for an additional seminar, in response to a request from the legislative members of the western and midwestern highway and safety committees of the Council.

The Committee was also preparing for a conference on the improvement of traffic courts, to be held in Miami Beach, Fla., in cooperation with the American Bar Association.

A highlight of Committee assistance in the formation of public-support groups, was the successful funding and staffing of a State foundation in Arizona. In this effort the Committee was assisted by its business advisory panel of 36 business leaders in 28 States.

Administration and Management

The accelerated highway program continued to impose great responsibilities on administration and increased the management burden at all levels during fiscal year 1959. New developments and rapidly changing situations affecting the program called for consideration and solution of complex administrative and technical problems new to the Federal-aid highway program.

To cope with such demands, attention was focused on procedures for continued improvement of administrative and management services with emphasis on the following activities: (1) Continuing improvement of organizational structure and functional alinement; (2) revision and development of procedures and standards for all areas of operation; (3) additional decentralization of functions and redelegation of authority to operating levels of responsibility; (4) strengthening of organizational segments by staffing of key positions with personnel of high professional and technical competence; and (5) concerted effort to further improve administrative and program operations.

Improvement in manpower utilization resulted from the systematic programs initiated by the new Administrative Services Division in the area of administrative services and facilities operations. Monetary savings have been realized through the efforts of the division in connection with records, space and property management, publications and visual aids facilities, and procurement activities.

Tangible and intangible benefits of far-reaching significance have also been derived from the operation of the new Merit Promotion Plan established January 1, 1959, to implement the Departmental and Bureau employee promotion policy. This program provided a fair and comprehensive method for evaluating employee skills, resulting in better utilization of manpower and the assurance of proficient and well-motivated personnel. Operation of the plan is resulting in greater job satisfaction and better morale. It is proving to be a stimulus to employee development and promises additional benefits in the area of personnel management.

Development of a complete financial management improvement program was begun during the year to provide a financial and accounting system responsive to the needs of top management officials within the statutory requirements of the Budget and Accounting Act of 1950. Additional personnel with outstanding qualifications in accounting systems work were recruited to assist in this phase of the program.

Studies were underway to develop a system of work measurement covering significant elements of Public Roads operations. The plan will be used principally for determination of field staffing needs and as support for budget requests.

Organization and staffing plans for each of the divisions have been formally approved, and those submitted for regional offices were being reviewed. These and similar actions were designed to achieve better integration of personnel activities with budget and management considerations.

A plan for development and issuance of an administrative manual was approved during the year. The manual will include operating instructions and procedures governing all functional responsibilities in the administrative field.

Development of New Practices

Electronic computers

Public Roads continued its efforts to further integrate the benefits of the electronic computer into the highway program during fiscal year 1959. Forty-three State highway departments now use computers—nine more than reported last year—as well as the Bureau of Public Roads and many highway engineering consulting firms.

This growth has been stimulated by the cooperative efforts of highway departments, consultants, universities, computer-user groups, the Bureau of Public Roads, and other Federal agencies. During the fiscal year 187 electronic computer programs were added to the Bureau of Public Roads program library, increasing the total to 296 programs available through this library to highway departments and other segments of the highway industry. Nine programs were converted into universal computer language during the year, making a total of 21 converted and circulated to computer users in the highway industry. In this form, the development and use of computer programs are greatly expedited, regardless of the make or model of computer.

Design of an electronic computer program for the analysis of equipment operation costs and rentals was completed by Public Roads. This will aid the State highway officials in compiling information on the cost and performance of each unit of their equipment, in conformance with the "Manual of Uniform Highway Accounting Procedures" of the American Association of State Highway Officials. The program was developed with maximum flexibility, so that it can be used in any State highway department regardless of the way in which costs are reported or derived.

A program for forecasting interzonal traffic movements for urban areas was converted into standard form for the Public Roads program library. This program, developed by Public Roads, uses the Fratar method of forecasting present interzonal movements, which are obtained from origin and destination surveys, to some future design year based on anticipated growth for each traffic zone.

Another program for preparation of data for trip desire contour charts also was completed for the library. The program, originally developed by California, summarizes present or predicted origin and destination survey data for the preparation of density of traffic desire contour charts which are useful in determining tentative locations of proposed highway improvements.

During the year, two electronic computer programs pertaining to the analysis and design of highway bridges were reviewed and converted to library form and distributed to State highway departments and other computer-user groups. One program is used for the analysis or design of a simply supported composite concrete slab and rolled steel beam section. The other program performs moment distribution and influence line calculations for continuous beams and single story rigid frames. In addition to making these bridge programs available for distribution, operational program decks for the programs were assembled along with detailed input data and operational instructions. Public Roads bridge engineers were using the programs in routine bridge design work.

Public Roads rendered assistance during fiscal year 1959 to highway departments and other highway organizations in the use of computer programs and in the organization of computer departments. As an example, Public Roads cooperated with the District of Columbia Department of Highways and Traffic in the development of a computer program by which present or forecasted interzonal traffic movements can be assigned to a citywide system of existing or proposed highway facilities for the determination of location and design criteria for freeway and expressway construction. As another example, Public Roads made a complete analysis of the Turkish Highway Department to determine applications suitable for an electronic computer, the type of equipment most suitable, the organizational structure of the proposed computer department most likely to insure a successful operation, and other organizational changes necessary to insure efficient machine utilization.

Equipment development

Progress in the field of equipment development continued during the year. Considerable effort was directed toward solution of equipment application problems in the compaction of embankments, base courses, and flexible pavements.

The cooperation of the Asphalt Institute, the tire and rubber industry, and the Highway Research Board was obtained in developing capacity criteria and equipment design requirements for pneumatic rollers which will compact base courses and high-type flexible pavements to a degree that will largely eliminate postconstruction densification and surface distortion in the wheel tracks. Such wheel track distortions are caused by the pressures exerted by heavy truck tires. The problem has recently become more acute with the introduction of extra high pressure truck tires, including the steel fabric types. The highway industry, including equipment manufacturers, has been apprised of this work, and available pertinent engineering data on both truck and compactor tire behavior have been released to them in collaboration with the tire and rubber industry.

The highway industry has been kept advised of promising new equipment developments and their performance, with the objective of encouraging more ready acceptance on a nationwide basis of machines which are capable of performing highway construction and maintenance tasks with greater economy.

By the end of the year the motor-grader performance tests which were being conducted for Public Roads by the U.S. Army Corps of Engineers were nearly complete. The tests will make it possible to establish new, improved criteria for classifying motor graders, for use in formulating new Federal specifications for motor graders being prepared by Public Roads at the request of the General Services Administration.

Materials

Public Roads participated in a limited evaluation of resin reinforced with glass fibers as a guard rail material. Comparisons were made of the effects of impact of a vehicle on guardrails of wire mesh, steel beams, and of reinforced resin molded to the same cross-section as the steel beam. The reinforced resin beam withstood the test impacts without failure or permanent deformation, although at the higher speeds the mounting brackets and steel posts were damaged.

The Bureau has cooperated also with industry in the development of glass-fiber reinforced resin tubing for fabrication into overhead sign structures. Several such structures had been installed over multilane divided highways in a number of States.

Additional uses of these resins were being developed for highway purposes. These include use as a bonding agent for thin concrete patches for repair of spalled and scaled areas on bridges and pavements, as a skid prevention treatment for highway surfaces, and as a coating for burlap used in curing concrete to retain moisture and reflect heat.

Methods and procedures

A Nuclear Energy Branch was established during the fiscal year in Public Roads to expedite applications of nuclear energy in the highway program which would improve present methods and procedures. As an example, Public Roads and a State highway department were evaluating an instrument using radium beryllium as a means of determining the moisture content and density of compacted highway embankments. Determinations made to date by this method, when compared to results obtained by conventional methods, show promise with added advantages in speed, cost, coverage, reduction of human factors, reproducibility and quality control.

Nuclear energy equipment was being used by industry to check welds made in the construction of highway bridges and to measure the thickness of various materials. These and other uses by industry were being evaluated to develop more applications that will benefit the highway program.

Development of an electronic computer method for analysis of highway location was continued during the year by the Massachusetts Institute of Technology, with participation by Public Roads and the Massachusetts Department of Public Works. Progress thus far enables the highway engineer to compare rapidly the construction costs of any number of possible highway alinements and grades within a strip several miles wide. Work had been started on computer programs to produce relative highway-user and right-of-way costs so that the total cost of each line and grade can be compared.

Public Roads maintained close liaison with highway contractors, material suppliers, and other segments of the highway industry through the national associations representing these groups. Many conferences were held during the fiscal year, at which mutual problems were discussed. At one of these conferences, for example, standardization of bridges and electronic computer methods of bridge design were discussed with representatives of the steel, concrete, and treated-timber bridge industries. The use of end-result specifications and of improved equipment such as the slip-form paver, as well as many other techniques for better highway construction, were discussed at a number of other conferences.

Radio communication

The use of radio by highway departments, contractors, and Public Roads continued to grow during the fiscal year. Public Roads participated with the highway departments in obtaining maximum benefits from radio in the highway program, in developing policies and procedures for coordinating frequency assignments, and in preparing data for presentation to the Federal Communications Commission on needs of the highway industry for radio as a means of communication and for many other purposes.

At the request of the District of Columbia Department of Highways and Traffic, assistance was given in planning a radio system for the remote control of the timing of traffic signals at 88 intersections. At the end of the fiscal year, installation of the system was well along. Savings over the cost of a cable-controlled system were estimated to be $2 million. Eventually the system is planned to cover 1,000 intersections.

Assistance was given to the Maryland State Roads Commission in developing plans, estimates, and OCDM participation in a statewide radio communication

system. At the end of the fiscal year, a contract had been let and applications for construction permits annd licenses were being processed by the Federal Communications Commission. Public Roads also participated with the State of Maryland in extensive tests of the tellurometer during the fiscal year. The results of these tests showed that this radio survey equipment greatly expedites the measurement of lines from 500 feet to 30 miles in length. Accuracies well within those required for highway work are easily obtained at much lower cost and with personnel of little experience. Thirteen States and many highway consultants were already using this equipment.

Experimental projects

During the fiscal year experimental projects were undertaken on a number of new subjects, hitherto untried, such as the effect of varying compacted densities on bituminous concrete pavement, phosphoric acid for stabilization of soils, additives in water to improve soil compaction, use of water-reducing admixtures and retarders in concrete mixtures, and use of cement, lime, or asphalt to control aggregate degradation.

Additional experimental projects were undertaken involving continuously reinforced concrete pavement, neoprene modified asphalt seal coats, and base and subgrade stabilization by means of cement, cement-lime, lime, lime-flyash, lime-asphalt, and asphalt.

Ten new experimental projects were initiated and constructed during the year. Approximately 170 experimental projects were under observation and were being reported. Observations on five projects were discontinued after tentative conclusions were obtained on their experimental features or additional construction had made further inspection impracticable.

AASHO Road Test

During fiscal year 1959, after completion of construction and instrumentation, controlled traffic started on the $22 million AASHO Road Test located near Ottawa, Ill. This largest of highway research projects, sponsored by the American Association of State Highway Officials, is being administered by the Highway Research Board with the cooperation of the member States of AASHO (from which the project derives its name), the Automobile Manufacturers Association, the American Petroleum Institute, the American Institute of Steel Construction, the Department of Defense, the Bureau of Public Roads, and other agencies, providing grants or contributed services.

Construction of the test road and related facilities was substantially completed in early October of 1958 and all contractor responsibilities were fully discharged in December. The 8-mile, four-lane divided facility, located between Ottawa and La Salle, is connected by large turnarounds to form a series of test loops. Ultimately, the test road is destined to become a link in a trans-State route of the National System of Interstate and Defense Highways. But, until some time in fiscal year 1961, the total facility will constitute an immense field research laboratory. From this research investment will come important new knowledge of pavement and bridge behavior, and significant contributions to the art of highway design, to the allocation of highway cost responsibility, and to the regulation of highway usage.

Essentially, the AASHO Road Test is a study of the behavior of concrete and bituminous road pavements of different thickness and layer composition and of bridges of varied design, subjected to traffic of controlled weights applied at uniform rates. The 836 test sections are arrayed in the 10 test lanes to cover a wide range of pavement thicknesses subjected to an equally wide range of controlled axle loadings, both single and tandem. The sections of each pavement

type have been constructed with precision and uniformity, in keeping with the major objective of directly relating pavement thickness to load supporting ability.

The operational phase was inaugurated on October 15, 1958, with appropriate ceremony to mark the beginning of controlled traffic which will continue 18 hours a day, 6 days a week, until September 1960. During the fiscal year, nearly 150,000 load-applications were applied in each test lane and altogether the 70 test vehicles have traveled more than 2 million miles.

To measure the effects of traffic, over 7,000 measuring devices have been installed in or on the test pavements and bridges and more than $1 million worth of complex electronic and mechanical equipment is in use for collecting and processing recorded data. The measurements program includes longitudinal and transverse profiles, static and dynamic strains, deflections, deformations on slabs and bridges, subsurface pressures and changes in thickness of pavement components, vehicle load-shift and transmitted load-forces, as well as various environmental and special studies.

As expected, some of the thinner sections have failed and have been reconstructed to carry the test traffic. Failed sections are excluded from consideration in the test but are kept under observation. At the close of the fiscal year, approximately one-fourth of the test sections had been ruled out of the test. While no conclusions can be drawn until the final analyses of some 19 variables affecting the behavior of the test sections, it is readily apparent that highly significant findings are in the making and that the test will amply fulfill its intended purposes.

Highway Planning Research

Traffic volume, classification, and weight information

Extensive traffic data from over 1,400 continuous-count stations and other traffic operations were obtained by the various States throughout the past year. During this period, highway travel increased 2.8 percent, compared to 2.3 percent for the previous 12 months. Rural travel increased 2.4 percent and urban travel, 3.4 percent. This represented a change in the trend of slightly greater growth of rural traffic than of urban traffic, which had prevailed since World War II.

Studies to establish more reliable methods of determining traffic trends and to provide more comprehensive information were undertaken. Computer analyses of extensive and detailed traffic data obtained during 1957 for the Highway Cost Allocation Study permitted the establishment of a new and more reliable base for determining future trends in travel by systems, in ton-mileages, and in weight frequencies. During that year weighing operations were conducted in cities for the first time.

Special procedures were established to obtain comparative information for the Interstate System and other highways in rural and urban areas so that the service provided by the Interstate System might be appraised. Vehicle-weight survey procedures were modified to obtain data for urban areas and toll roads each year. It is anticipated that by taking full advantage of such technological developments as the electronic computers, available to most State highway departments, and equipment for weighing and measuring the axle spacing of moving vehicles, it will soon be possible to obtain economically more accurate and comprehensive data than ever before.

Efficiency evaluation of traffic counting procedures has been continued and the programs in nine States were reviewed statistically during the year.

A comprehensive analysis of the distribution of truck weights was begun in Illinois. The objective of this work is the development of optimum sampling

schedules for use in the future, to obtain accurate estimates, at reasonable cost, of weight characteristics of trucks of different types. Weight station locations for planning and research purposes on the Interstate System were approved in a number of States.

Statewide origin and destination surveys were inaugurated in Arizona and Kansas and plans were made for conducting similar studies in the 14 States included in the Mississippi Valley Conference of the American Association of State Highway Officials.

Motor-vehicle-use studies

Studies of motor-vehicle use, conducted in cooperation with the State highway departments, were continued during the year. At the end of the fiscal year fieldwork had been completed in 24 States. Several other States are expected to start such studies during the next fiscal year. These studies, Statewide in scope, are designed to yield information about the characteristics of motor-vehicle ownership and use. Among the pertinent data collected are estimates of total vehicle travel as distributed among the various highway systems used, and between urban and rural areas; methods of transportation used for home-to-work travel; and the frequency, length, and purpose of trips made.

Based on data available from 20 States, automobiles and/or trucks were owned or operated by residents of 75 percent of all occupied dwelling units. As might be expected, the proportion was larger in unincorporated areas than it was in incorporated places, the percentages being 80 percent for the former and 70 percent for the latter.

Of the gainfully employed persons covered by these studies who were required to travel to their place of employment, 68 percent traveled by auto, either as a driver or as a passenger; 15 percent used public transportation; while 13 percent walked to work. Of the 68 percent that traveled to work by auto, more than one-half lived less than 5 miles from their place of employment. Three-fourths of the persons who walked to work lived less than 1 mile from their place of employment.

Road inventory and mapping

Road inventory operations in 45 States and in Puerto Rico produced needed data on the degree of improvement of individual rural road sections together with the growth and change of character of roadside culture. The information obtained was used in studies of highway deficiencies and in the preparation of 280 county general highway maps in 28 States.

Other maps were reviewed or redrawn under the cooperative highway planning program. These included 5 State general highway maps, 23 State traffic maps, 393 county traffic maps, 74 city traffic maps, and 1,088 maps of incorporated places.

Information on load-carrying capacity and vertical and horizontal clearances of all structures on the Federal-aid primary highway system and other important through routes was obtained and furnished to the Department of Defense.

Highway statistics

During the year the annual "Highway Statistics" (for 1957) was published. This volume includes information for each State on motor-vehicle registrations, highway-user taxation, motor-fuel consumption, highway finance, mileage of highways, and related information.

Traffic studies in cities

Comprehensive home interview studies of travel and vehicle use were started in 4 cities bringing the total of such studies to 140, of which 13 are repeat sur-

veys. Continuing studies are in progress in Chicago, Detroit, and Washington.

A Public Roads research engineer consulted with and provided technical assistance to the Turkish General Directorate of Highways in organizing a home-interview transportation study in Istanbul. This assistance was requested through the International Cooperation Administration.

Forecasting and assignment of traffic

During the year work was continued on the development of information for estimating traffic that is diverted and that which is generated by the construction of new or improved facilities. Basic data for this purpose were provided by origin and destination surveys made by the Maryland State Roads Commission covering all roads between Washington and Baltimore. Traveltime and distance information on the several routes between the two cities are now being collected to supplement the origin and destination surveys.

An electronic computer program for assigning traffic to a highway network—that is, forecasting probable usage of streets in the network—was developed and has been used by the Washington, D.C., Department of Highways and Traffic. The Minnesota and Ohio highway departments have also made arrangements to use the assignment program during the year. Modification of the program to include the assignment of traffic by direction and by peak and off-peak hours is underway.

The Public Roads electronic computer has been used extensively. A program has been developed to evaluate the accuracy of origin-and-destination survey sample sizes and the relative difference between the 1980 traffic forecasts developed by two different agencies for one particular city. Another program is under development to code origins and destinations automatically on a computer. Work is continuing on the development of prediction formulas for interarea travel and intercity travel.

Two major analyses were initiated during the past year, both concerned with development of factors and procedures to be used in estimating future traffic in urban areas. One analysis is an attempt to determine a reliable equation, using land-use and population data as independent variables, which can be used to estimate the traffic produced by and attracted to small areas in a metropolitan region. The second project is the development and testing of various interarea traffic models, involving procedures which can be used to synthesize the movement of traffic in an urban area once the trip production and attraction of the individual zones have been established.

Urban highway planning and research

In the expanding urban areas, there is increasing need to integrate plans for the development of highway transportation with those concerned with the general pattern of urban development. Through continuing urban research, relationships are being established between the pattern of land use and the movement of people and goods. These will form the basis of procedures for estimating the transportation needs for both present and future patterns of urban development.

Research is underway to relate the use of transit and automobiles in the entire urban area and the principal factors influencing that use. A preliminary equation to date has indicated that the most influential factors are: Population, transit-service ratio, economic, land-use distribution, and urbanized land area.

Throughout the year, staff assistance was provided by Public Roads to the Joint Committee on Highways of the American Municipal Association and the American Association of State Highway Officials. This Committee was instrumental during the year in the promotion of the Sagamore Conference on High-

ways and Urban Development. The findings and recommendations of the Conference have been endorsed by the Bureau of Public Roads as the means of cooperatively planning highway and urban development.

Traffic Operations Research

Instrumentation research and development

The mobile "traffic analyzer," a truck-mounted unit capable of measuring speed, lateral placement, and spacing of vehicles on the road, has been in continual operation since its completion last year. During the short periods of time between traffic studies, a few improvements have been made including the substitution of automatic for manual switching to record vehicles straddling lane lines. The engineering design was also completed and construction started on an electronic memory and read-out system to eliminate the operational difficulties discovered in the mechanical system used in the commercially obtained recording equipment. The electronic design for a second traffic analyzer unit, to be built in 1960, was completed this year.

An instrumented passenger car, tentatively called a "traffic impedance analyzer," was designed, equipped, and put into operation during 1959. Digital recording of speed, mileage, time, and manual code was provided to allow accurate traveltime or speed and delay studies to be accomplished. Later a recording of fuel consumption was added to aid in vehicle characteristic studies. The addition of continuous placement recording has been proposed for 1960.

Driver behavior research

The Bureau's mobile traffic analyzer unit was used to obtain driver behavior data and highway capacity information in California, Connecticut, New York, and Illinois.

The California research continued study of the effects on traffic operations of highway grades, expressway ramps, and other design features of various types. On the Connecticut Turnpike research continued on the effects of highway lighting on traffic flow. This study was made with lighting at varying intensities, with and without edge markings and with and without roadside delineators.

In New York, studies were made of the effect on traffic flow in terms of lateral placement, of narrow barrier-type medians installed on previously undivided highways.

In Chicago, data were recorded, at the request of area traffic authorities, with the hope that it would be possible to discover identifiable "danger signs" in traffic behavior several moments before congestion develops. If such exist, a controller at a central control center could detect signs of imminent congestion in the traffic flow data electronically relayed to him and could take remedial action before congestion actually set in.

Highway capacity research

Traffic congestion in urban areas is one of the greatest problems facing highway engineers today. Right-of-way and other problems in some areas prevent the construction of freeways or expressways to relieve the congestion. Methods therefore must be found to develop increased traffic-carrying capacity on existing arterial streets.

During the year, major research in this area was initiated. Wisconsin Avenue in Washington, D.C., was selected as a typical urban arterial street, and all phases of its operation were subjected to detailed field study. Analyses of the field data were underway at the close of the year, to discover all feasible ways of increasing the street's capacity without major encroachment on exist-

ing property on the street. These steps will include examination of the potentialities of "bottleneck" elimination, better operational techniques involving little additional expense, more extensive signalization, reconstruction, and widening. Also included will be a legal analysis to determine what legislation and delegation of authority are necessary to implement such improvements. From this pilot study, a procedural manual will be developed to guide traffic authorities throughout the country in pinpointing their capacity problems on existing streets and in selecting effective corrective measures to develop increased city street capacities.

Collection and analysis of new data for use in revision of the "Highway Capacity Manual" continued during the year. While detailed high-speed computer analyses of the recent intersection capacity data from 1,100 approaches are still continuing, revised intersection capacity curves were released for nationwide use, superseding those appearing in the manual.

Plans for a nationwide study of freeway ramp operation were formulated late in the year, with field studies planned for fiscal 1960 to complete the gathering of data needed for the revised manual. These general studies will be supplemented with more detailed ramp studies made in connection with driver behavior investigations at several interchanges on freeways. The detailed studies will provide both ramp and through freeway capacity data.

Accident experience related to control of access

The most important single factor in accident reduction ever developed has been full control of access whereby entrance and exit movements to and from the through traffic lanes of a highway are limited to carefully planned points where these maneuvers can be performed safely. Freeways, turnpikes, and most parkways have full control of access.

Since 1951, the continuing study of accident experience as related to control of access, in cooperation with 30 State highway departments, has encompassed over 25 billion vehicle-miles of travel on some 2,600 miles of highway with varying degrees of control of access; 75,000 accidents are included. The latest summary shows again that accident and fatality rates on highways with full control of access are only one-third to one-half as great as those on highways with no access control. In rural areas, highways with full control of access have an average rate of only 3.3 fatalities per 100 million vehicle-miles of travel compared to 8.7 for highways with no control of access. In urban areas, highways with full control of access have a fatality rate of 2.0 compared to 4.0 for highways without control of access. While accident rates in urban areas are higher than in rural, the accidents which do occur in rural areas are more severe in terms of fatalities resulting. Full control of access nearly eliminates head-on and angle collisions although the few that do occur are quite severe. Rear-end collisions are cut in half. Control of access, however, has little effect on accidents involving only one vehicle.

In contrast, partial control of access tends to give drivers a false sense of security, leaving them unprepared to contend with the vehicle conflicts which do exist under partial control. While it is beneficial in some areas, in others it is worse than no control at all, from the standpoint of safety.

Stop-and-go signals sometimes increase accidents

Stop-and-go signals which are installed at proper locations and operated efficiently are a most effective and necessary control to facilitate traffic movement. Improperly installed or inefficiently operated traffic signals, however, can cause unnecessary delays and accidents. In Michigan, a study of 89 intersections was undertaken before and after the installation of traffic signals. Two types

of traffic signals were studied: Stop-and-go signals (the familiar green-yellow-red traffic lights), and flashing beacons that flash yellow on the main highway and red on the crossroad.

After stop-and-go signals were installed, accidents actually increased 23 percent. Large increases were noted in rear-end, head-on, and sideswipe collisions. Angle collisions were reduced however, and the number of persons injured diminished 20 percent. In contrast, after flashing signals were installed, accidents were reduced 26 percent while personal injuries were cut in half.

The results showed that stop-and-go signals were more effective at the high-volume and more complex intersections. Flashing beacons were particularly effective during inclement weather and in areas of low traffic volumes.

Fatal accident rates by hour of day

Many studies have shown that accident and fatality rates are much greater at night than during daylight hours. Correlation of data from State traffic and accident sources indicate that the fatal accident rate (number of fatal accidents per 100 million vehicle-miles of travel) varies considerably throughout the average day and has an even greater variation at night, reaching a peak of about 21 between the hours of 2 and 4 a.m. The rate is less than half as great between 9 and 11 p.m. It is dark during both of these 2-hour periods throughout the year so, although darkness may compound some of the difficulties for nighttime drivers, fatigue, intoxication, higher speeds of travel, and other factors probably contribute to the extremely high fatal accident rate during the hours shortly after midnight. Only carefully planned research can determine and measure the contribution of the factors involved and point the way toward night accident reductions.

Driver and vehicle characteristics related to highway accidents

To provide answers to many questions related to traffic safety (see "Reports to the Congress"), 11 State highway departments cooperated with the Bureau of Public Roads in undertaking comprehensive studies of driver and vehicle characteristics related to accidents on main rural highways. The speeds of 290,000 drivers were measured and the drivers were later stopped and interviewed. Corresponding data were obtained for 10,000 drivers who had been involved in accidents along the 35 sections of highway on which drivers were interviewed. An electronic computer was employed to combine these data with other traffic information and derive accident rates for various driver and vehicle characteristics.

The study showed that younger drivers were more likely to be involved in accidents. Drivers under 20, for example, were about four times as likely to be involved in an accident as drivers 35 to 50 years old in the same amount of driving.

From the study it was found that the accident involvement rate was higher at speeds below 40 miles per hour than at any faster speed, and the lowest involvement rate was at about 65 miles per hour. When an accident did occur at the higher speeds it was more likely to be severe; at 75 miles per hour, for example, the likelihood of an injury occurring was nearly four times as great as it was at 50 miles per hour.

The study indicated that there was little difference in accident involvement between male and female drivers. Drivers in the Armed Forces, however, were twice as likely to be involved in an accident as other drivers of comparable age groups in the same amount of driving.

The study showed that cars with 110 horsepower or less had significantly higher accident involvement rates than higher powered cars, and the involvement

rate remained nearly constant as horsepower increased from 120 to the highest powered passenger cars. Detailed analysis showed this to be so regardless of travel speed; sex, residence, or age of driver; body style or age of car; and day or night conditions.

Economic cost of motor-vehicle accidents

Studies of the economic cost of motor-vehicle accidents continued in Massachusetts, New Mexico, and Utah, and a fourth study started in Illinois during the year. Several other States are awaiting completion of other important planning survey work before launching similar studies.

In each cooperating State these studies encompass the total driving experience of all motor-vehicle owners in the operation of passenger and cargo-carrying vehicles during the period of a year. A great mass of comprehensive and detailed data have been prepared from the studies, relating traffic accidents and their economic cost to highway systems, traffic volumes, road conditions, age and sex of driver, type and age of vehicle, light and weather conditions, and other important elements affecting the safety and efficiency of the highway transportation system.

Some of the results of these first studies have already been published. They were used extensively in the report to Congress entitled "The Federal Role in Highway Safety."

Economics of motor-vehicle size and weight

An important area of research is determination of the optimum economic size and weight limitation for commercial vehicles, and the magnitude of increased demand for highway transport which might be brought about by increasing these limitations. Nearing completion is a study relating changes in vehicular operating costs to changes in gross weights of tractor-trailer combinations. Another study is underway comparing gross vehicle and axle weights with the costs of constructing and maintaining highways. Work has been started on a model to correlate the two types of data.

Differential road-user benefit analysis

In connection with the highway cost allocation study, research was underway to establish the differential road-user benefits resulting from the improvement of the various highway systems, both rural and urban. A model of the analysis was tried during the year and showed the need for additional vehicular cost and performance data, for a variety of vehicle types and operating conditions. To obtain these data, a program of fieldwork was initiated in the summer of 1959. A series of tests on buses and heavy freight trailer combinations were being conducted by the University of Washington under contracts with Public Roads and the Washington State Highway Commission. Similar tests of passenger cars and light trucks were being conducted by Public Roads near Washington, D.C.

Brake research

A comprehensive study of emergency braking systems for combinations of commercial motor vehicles has been undertaken by Public Roads at the request of the Interstate Commerce Commission. Tests were being conducted which will resolve substantial areas of controversy concerning the safeguards in motor-vehicle braking systems necessary to prevent "runaway" accidents on the highways. The study has been undertaken with industry participation and with the advice and assistance of an Advisory Committee to the Interstate Commerce Commission.

The program for study provides for: (1) Laboratory tests to ascertain the magnitude of delays inherent in various power breaking systems, and to determine which components of various emergency braking systems operate compatibly with one another; (2) actual vehicle stopping tests on the level and on grades to study the behavior of vehicles with normal brake operation and under conditions of simulated brake failure; and (3) service tests to determine the reliability and need for maintenance of various emergency braking systems.

The major portion of the laboratory tests has been completed. Vehicle stopping tests were being conducted during the summer and fall of 1959.

Dynamic characteristics of commercial vehicle loads

The first steps of a comprehensive research program in road loading mechanics, conceived as one leading to a better basic understanding of the transportation system as a whole, have been undertaken by Public Roads through cooperative research projects. The need exists for a long-range development of a dynamic theory, adequately substantiated by experiment, which would permit the prediction of road life from the characteristics of the traffic flow, and which also would indicate the effects of changes in vehicle suspensions and other elements of the system. A complete analysis, properly relating the dynamic and static performance factors of both vehicle and road, is envisioned. The experimental approach to the problem was being investigated under a cooperative research contract with the Purdue Research Foundation. The theoretical approach, which would result in a complete systems model utilizing high-speed computer programs, was being given preliminary study by Cornell Aeronautical Laboratory.

Highway Needs and Economy Research

Finance and taxation studies

Research into problems of highway taxation and finance continued during the year, with most of the emphasis being placed upon the prosecution of work related to the Bureau's highway cost allocation study. This included completion of the analysis phases of studies of commercial bus operations and of the impact of the accelerated highway program on those segments of industry most directly related to highway construction. Methods and bases of taxation for highway purposes and the distribution of responsibility for the financial support of the highway function were also investigated.

Production studies

In the field of equipment performance, research has been done on the drying of aggregates for bituminous admixtures, using a scale-model dryer at Ohio State University. Studies were made of aggregate behavior during the drying process to develop techniques for predetermining operating characteristics of aggregate dryers.

Jobsite studies of equipment performance were made on 33 construction projects throughout the country. These were principally in connection with the operation of dual-drum pavers and of all types of equipment experiencing traffic problems during construction operations. Analyses of field data were underway.

Management of an extensive cooperative study in Iowa of equipment use and performance in State highway maintenance was undertaken. Following completion of preliminary work early in fiscal year 1960, a 1-year scheduled study will start.

A 30-minute motion picture, "Lost Mixing Time of Dual Drum Pavers," was completed and distributed among highway engineering groups. This film deals with those performance characteristics and field practices which result in wastefully extended paver cycle time or needlessly reduced mixing time. It shows, in animated form and in live action scenes, the mechanical process of mixing concrete with a dual-drum paver.

Highway investment studies

Using the current price index, the investment in all roads and streets in the United States from 1914 to the present was developed as it pertained to grading, surfacing, and structures. Eight States supplied information which, with the developed data, was used to compute the investment remaining each year. Analytical estimates of highway needs, based on the relation between growth in traffic and corresponding growth in highway investment, were completed for the Interstate System. Similar needs studies were being conducted for other highway systems.

Pilot studies were started on the collection of data to determine the service life of highways by traffic volume groups and by reason of retirement, whether structural deterioration or functional obsolescence.

Other studies

A pilot study was initiated in the Wisconsin State Highway Commission to determine what external or internal factors affected the production of plans. The study was being conducted on the basis of total time elapsed in the preparation of plans. Delays were analyzed and classified, flow charts were prepared, and all policies and procedures relating to the production of plans were cataloged.

Assistance was provided to the National Association of County Engineers in their research program on methods of county road management. The specific purpose of this aid is to develop a procedure manual for the preparation of long-range county road improvement programs.

Highway and Land Administration Research

Economic impact studies

A significant development in highway research in the fiscal year 1959 was the increased emphasis directed toward economic impact research in connection with highway improvements. During the year a total of 14 economic impact research studies were completed, in cooperation with Public Roads. At the year's end, there were some 40 studies underway in 31 States.

With more groups and individuals taking a greater interest in the expanded highway program, State highway officials were seeking to evaluate the economic effects of their activities. The results were being used in connection with hearings, right-of-way acquisition, public relations, highway location and design, and in other ways.

The nature of the highway economic impact studies varied widely, and included such highway improvements as expressways, bypasses, alternate routes, secondary roads, and urban streets. For example, one study investigated land-use changes along the Boston, Mass., circumferential highway and evaluated the factors underlying those changes. The study was unique in that it attempted to arrive at some net benefits which accrued to the entire metropolitan area by tracing relocated industries and analyzing dispositions made of former locations in terms of vacancies, character of new uses, assessments and tax revenues, labor volumes, etc.

Land acquisition, control of access, and related studies

In cooperation with the American Bar Association, a summary was completed of all court decisions handed down during the year that involved the condemnation of property for public purposes. Trends in the thinking of the courts of several States were analyzed.

A study of all court decisions in which control of access was at issue was brought up to date. A final report will attempt to indicate trends in judicial thinking in this field.

Continuing assistance was rendered in surveys and analyses of State highway department accounting procedures involving land acquisition, in cooperation with the Committees on Right-of-Way and Uniform Accounting of the American Association of State Highway Officials. These groups are interested in developing standards in the right-of-way field, for ultimate inclusion in the manual on uniform accounting procedures.

In cooperation with the American Association of State Highway Officials, efforts were continued to develop State right-of-way training programs and to assist the various State highway departments in adopting these programs to meet their own particular training needs. The development of a comprehensive right-of-way training manual was also continued.

A study was commenced of all highway condemnation cases involving an appeal to a higher court, in order to ascertain what the basis of the appeal was, who prevailed on appeal, and why.

Administrative research

During the year, a 1952 report on State highway administrative bodies was revised and rewritten to reflect conditions as of 1959. This report was published originally by the Highway Research Board and is part of the research program of the HRB Committee on Highway Organization and Administration. At the end of the year, work was in progress on an analysis of existing highway management reports. This analysis will show what management areas need attention and will suggest priorities for research in the indicated areas.

Terminal facilities research

During the year, work was started on updating a summary of urban parking legislation on which a considerable amount of work had been done previously. Research in this area of the urban problem is important since a complete transportation service involves the vehicle both in motion and at rest, from origin to destination.

Highway laws

The comprehensive study of highway law, in which the Highway Research Board, the American Association of State Highway Officials, and the Bureau of Public Roads are cooperating, was continued. Reports on system classification, legislative purpose in highway law, Federal aid, outdoor advertising, and a second report on condemnation of property for highway purposes were published during the year. Research has been completed for reports on intergovernmental cooperation, constitutional provisions concerning highways, and a third report on condemnation.

Urban research

Working with the Urban Research Committee of the Highway Research Board, Public Roads sponsored a framework study for urban research at the University of Wisconsin. Outstanding current developments in the field of urban transpor-

tation were also analyzed and reported during the year. A set of criteria were developed for evaluation of research proposals and establishment of priorities for research investigations.

Hydraulic Research

Research on the hydraulics of culverts on steep grades is being conducted for the Bureau of Public Roads by the National Bureau of Standards. Such culverts have usually operated at less than capacity because of "entrance loss," that is the inability of the inlet end to accept as much water as the culvert is capable of carrying. Criteria have now been developed for the design of flared entrances both in line with the culvert barrel and tilted down to accelerate the flow at the entrance. This information was being passed on to the manufacturers who will develop precast concrete and prefabricated metal end sections for pipe culverts. Such structures, which will also be developed for box culverts, will significantly increase the quantity of water which can be carried for a given cost.

In cooperation with the Corps of Engineers, an investigation was being made at the Waterways Experiment Station to determine the flow resistance coefficients for metal pipe with large corrugations.

Public Roads also participated in another investigation of pipe roughness, sponsored by the Florida State Road Department with Federal-aid funds. This investigations was concerned with the hydraulic roughness of machine-tamped concrete pipe and cast-and-vibrated concrete pipe, and the effect of irregularities in the joints. The experimental work, conducted by the St. Anthony Falls Hydraulic Laboratory of the University of Minnesota, had been completed and a report was in preparation.

Another aspect of storm drain design is the problem of intercepting the water flowing in roadway gutters. An investigation of the hydrodynamics of curb-opening inlets was being conducted by Stanford University for the Bureau of Public Roads.

In a project sponsored jointly by the city of Baltimore, Baltimore County, and the Bureau of Public Roads, the Johns Hopkins University was making measurements of storm water runoff from a number of typical urban areas in Baltimore and the adjacent county. Measurements had been started on watersheds in flat terrain to broaden the scope of the investigation. A tentative new method for designing storm drain systems was evolved but required further checking before it could be recommended as a working procedure.

An attempt at developing reliable information on the magnitude and frequency of floods in the arid and semiarid regions of the West was being made by Colorado State University under a project sponsored by the Bureau of Public Roads. The initial results applying to the high plains of eastern Colorado and Wyoming appeared to be reasonably successful despite the relative scarcity of data.

A good engineering approach to the hydraulic design of culverts is still hampered by the lack of a reliable method of estimating what the peak rates of runoff are likely to be. Preliminary results have been obtained in the classification of watersheds according to the underlying rock formations and the estimation of peak rates of runoff on the basis of physiographic factors such as channel slope and watershed area. Climatic factors undoubtedly will be involved.

Two investigations were in progress involving scour around bridge piers and abutments. This work, sponsored by the Bureau of Public Roads, was being done at Colorado State University. Experimental work was nearly complete on models of bridge abutments placed in an alluvial stream bed. Systematic

relations between the depth of scour and the geometry of the channel contraction caused by the bridge were being developed. The second investigation was undertaken at the request of, and financed by, the State highway departments of Alabama and Mississippi using Federal-aid funds. It was concerned with establishing criteria for the shape and size of spur dikes constructed at bridge abutments to alleviate the scour problem.

The application of hydraulic research to practical design problems necessarily requires that the highway engineer become thoroughly familiar with the basic principles of hydraulic design involved. As a means of facilitating this educational process, the Bureau of Public Roads engaged Colorado State University to prepare the first of a proposed series of training films. The film will illustrate the principles of open-channel flow by means of laboratory demonstrations, and scenes of similar occurrences at actual highway structures.

Physical Research

Soils, foundations, and flexible pavement studies

Highway engineers have been alerted to the potential use of nuclear energy in many types of materials research and control. Cooperative studies, in which radioactive materials, detectors, and counting devices are used for the measurement of the moisture content and density of soils and aggregates, were started in Arizona, Maine, and North Carolina. Conferences were held with the Highway Research Board regarding other potential applications of nuclear energy in highway engineering, including the determination of uniformity of mixtures, thickness of flexible pavement courses, and moisture movement.

The development of methods of stabilizing soils and improving low-quality aggregates for use in areas where the supply of high-quality aggregates is not adequate for the highway construction program was continued. Field inspection in April of an experimental road section in Missouri, constructed the previous October with a plastic subgrade soil stabilized with phosphoric acid and a small percentage of an amine, indicated that the treatment could reasonably be expected to be effective. This method of stabilization was developed by laboratory study in the cooperative program of Public Roads and the chemical industry. Laboratory study of another chemical process for soil stabilization is underway. A cooperative study of the use of lime and flyash for stabilization of slag was started in Illinois.

The scarcity of known sources of high-quality aggregates in some areas has caused additional States to make a concerted effort to locate natural materials sources by using aerial photographs, soil and geologic maps and reports, and earth-resistivity equipment. Cooperative aggregate surveys are underway in Arizona, Idaho, Maine, New Mexico, North Dakota, Oklahoma, Oregon, Vermont, Washington, and West Virginia.

The development of soil maps and engineering interpretations regarding soils was continued. The information derived will be useful in highway location studies and in planning soils surveys for highway projects. Highway departments of 21 States are testing samples collected by the Soil Conservation Service, in a cooperative program with that group. Engineers in these and several other States are assisting in the preparation of information for the soil survey reports. Public Roads either prepared or reviewed the chapters on engineering application for 13 county soil survey reports and received soil samples from 61 additional counties or areas located in 27 States. A total of 4,400 soil samples have now been obtained from 133 counties since the cooperative program was started in 1951. As part of a separate study, a State soils manual was prepared for Oklahoma.

Technical assistance was given in the solution of embankment problems in Arkansas, Maine, Ohio, and Virginia. Cooperative studies to develop information regarding foundation or slope problems included embankment settlement and stability in Nebraska, embankment and cut-slope design methods, and correlation of inplace soil strength with laboratory data in Oregon, and evaluation of sand drain procedures in New York.

Comprehensive field investigations in cooperation with Oklahoma and South Dakota to correlate flexible pavement design with pavement performance, soils, environmental conditions, and loading were continued. A similar correlation was started in Arkansas. A total of 129 pavement sections, having a total length of 972 miles, were under intensive study in these investigations. Cooperative studies were inaugurated in Georgia and Nebraska for the purpose of obtaining fundamental data on the mechanics of load support of flexible pavements. The cooperative study of load-deflection of selected flexible pavements in Maryland was continued, and similar studies were initiated in Oregon and South Carolina.

Bituminous materials and pavements

The accelerated highway program has created a greater interest in the proper control of materials, the design of bituminous mixtures, and the construction details that affect the quality and performance of bituminous surfaces.

More interest has been shown by State highway departments in controlling plant mixing temperatures by the viscosity of the asphalt during mixing. To evaluate this properly, a test was needed to determine when proper mixing had been accomplished. Studies were made and a tentative procedure for determining the uniformity of coating and distribution of the asphalt in the mixture was developed.

A motorized gyratory compactor for preparing laboratory specimens of bituminous mixtures was being constructed to conduct needed research for establishing optimum compaction of bituminous mixtures in the laboratory and for correlating laboratory and field compaction. This device should excel others now in use in producing compaction more nearly like that obtained in prototype pavements.

New uses of radioactive isotopes for evaluating the properties of bituminous mixtures and pavements are being developed. A cooperative study was started in Arizona in which radioactive materials were being used to determine the asphalt content of bituminous mixtures.

Research studies were continued in the correlation of properties of bituminous mixtures and pavements with field performance. Experimental bituminous pavements were constructed in Delaware during the past year, in addition to those previously constructed in Maryland and Virginia. Under a cooperative agreement with the Georgia State Highway Department, a correlation study to improve asphalt pavement design was started by the Georgia Institute of Technology. Study of the effect of drying and heating on the properties of aggregates for bituminous mixtures was being continued by the Public Roads laboratory and in cooperation with Ohio State University.

Cracking of bituminous surfaces constructed on flexible bases is of considerable concern to a number of States. Because of the lack of suitable test procedures, little information is available on the properties of flexibility and causes of fatigue failure in bituminous surfaces. Laboratory apparatus for studying this problem has been designed and was being built.

Research to determine the chemical characteristics of asphalt cements and the relation of these characteristics to performance in the highway pavement was begun. This includes the application of chromatographic techniques for

separating the asphalt into components and the use of infrared and ultraviolet spectroscopy to identify specific compounds or groups present in the components. The objective of these studies is to relate the composition of asphalts to physical changes that occur in service. Some of this work was being conducted in cooperation with one or more asphalt producers.

Important progress was made in the development and use of improved methods of test for bituminous materials. The thin-film oven test developed by Public Roads to evaluate resistance of asphalt to hardening during the manufacture of the pavement has now been accepted as a specification test by 10 State highway departments and by the Asphalt Institute.

Progress has also been made toward establishing a suitable and precise method for determining the viscosity of asphalts in fundamental scientific units by means of the sliding plate microviscometer and the Zeitfuchs capillary viscometer.

The research investigation of the properties of approximately 150 asphalt cements of the 85–100 penetration grade produced in the United States for use in highway construction was completed and reported. This, together with a similar study covering the properties of the other grades of asphalt cement used in the United States, now makes available valuable information for the development of better specifications.

In conjunction with the laboratory research on asphalt, several studies were made to determine the progressive changes in asphalt that occur in service. Some of these studies were being conducted cooperatively with State highway departments and with the Asphalt Institute.

The development of new or modified bituminous binders was followed closely by Public Roads. A preliminary investigation was made of a process proposed for producing a road binder from coal. Laboratory study and field observations will be made of experimental construction using this binder. The progress of other efforts to improve bituminous binders based on the blending of elastomers and epoxy resins with asphalt is also being observed.

Chemical investigations

Investigations of the methods of chemical analyses and chemical properties of highway materials were continued. A report on the loss on ignition of portland blast-furnace slag cement was completed and published. The study established the validity of a proposed empirical method and also resulted in a new and more rapid method for making the test.

A report on the chemical test for determining the alkali reactivity of concrete aggregates was completed. Deficiencies of the present standard test method were defined and an improved approach toward interpreting test results was proposed.

Laboratory work on methods of chemical analysis for concrete retarders was completed and a report was being prepared. Procedures were developed, utilizing infrared and ultraviolet spectrophotometry, which will provide State and Federal agencies with the means for quickly establishing the identity and concentration of such materials. Thus, they will be able to determine quickly whether any change has been made in materials supplied at various intervals and thereby have assurance of continued uniform performance when the material is used in concrete.

Preliminary study indicates that the technique of infrared spectrophotometry is equally suited for the rapid evaluation of uniformity and composition of many other products used in highway construction, such as air-entraining and water-reducing admixtures for concrete, bituminous materials and additives, and complex paints for structural steel and pavement marking.

Exposure studies of new corrosion-resistant paints for highway structural steel were continued. The results of such studies will determine the specifications to be used for obtaining better and more economical paints.

Exploratory investigations on the use of epoxy resins indicate that such materials have considerable promise for highway construction. Possible applications include their use as bituminous admixtures, bonding and sealing agents between concrete bridge decks and bituminous surface course, and as additives to produce more durable traffic-striping and structural steel paints.

Cement, aggregates, and concrete

An investigation of water-reducing retarders for portland-cement concrete has been completed and a report is being prepared. Most of the products tested are also water-reducing agents. It was found that these materials, in addition to being useful for retarding the early set of concrete, generally increase concrete strengths at all ages without adversely affecting the durability of the concrete.

The methods of evaluating water-reducing retarding admixtures have been studied. Chemical tests for determination of composition and uniformity are essential but additional physical tests of the concrete that contains a retarding admixture are necessary. A comparison of the method of measuring retardation was made and the practicality of the method in current use was proven. From the results of the study of the effects of retarders on concrete and the methods of measuring retardation, it was planned to prepare a guide specification for their acceptance and use that will be of benefit to public agencies and others in the preparation of specifications for retarders.

A study of lightweight aggregates for concrete was started, including 2 expanded slags, 2 lightweight materials manufactured by the sintering process, and 12 manufactured by the rotary process. Such properties of the concrete as strength, durability, and volume change under various conditions of laboratory and outdoor exposure, were being determined. In addition, an attempt was being made to relate the properties of the aggregate particles themselves to the properties of concrete.

Concrete scaling resulting from the use of calcium chloride for ice removal was still under study. Over 200 15- by 24-inch slabs, composed of various combinations of cements, aggregates, and admixtures and treated with various surface-treatment compounds, have been subjected to applications of calcium chloride under outdoor exposure. These tests demonstrated that air-entrainment provides good resistance to scaling resulting from chloride applications.

A study of the efficiency of type 34–E dual-drum paving mixers was conducted in cooperation with 12 States during the year and will be completed in the year following. The effect of time of mixing and of overload on uniformity and strength of the concrete was determined. As mixing time authorized in State specifications varies from 50 to 120 seconds per batch, and overloads of as much as 20 percent are permitted, a saving in time without a loss in quality of concrete could result, if minimum mixing time and maximum loads were determined and combined. Reports to date indicate that savings can be accomplished but it has been observed that problems of supplying materials to the mixer must also be considered.

Structural design of concrete pavements

Development of information to improve the structural design of concrete pavements was continued. Activities in this field were directed primarily toward investigations of the practical value of new features of design.

Research on the performance of jointless, continuously reinforced concrete pavements was expanded with the construction of experimental projects in Michigan and Maryland and the planning of projects in five other States. Observation and study of the behavior of five of the nine continuously reinforced pavements now in existence were continued. These pavements include a considerable number of design variables and provide a rather extensive research coverage of these principal features. Information so developed, applied to subsequent experimental pavements, has been resulting in increased refinement in design.

Road surface research

Efforts directed toward developing better methods and apparatus for evaluating the smoothness and skid resistance properties of pavement surfaces have been continued. The Bureau's Road Roughness Indicator has been demonstrated to a number of highway engineers to acquaint them with its characteristics and usefulness. More than one-third of the States and several foreign countries have constructed such devices from plans and specifications supplied by the Bureau of Public Roads.

Public Roads participated with other Federal, State, and commercial groups in correlation studies with their new skid resistance equipment at the First International Skid Prevention Conference in Charlottesville, Va. Progress has been made in developing and improving this equipment to measure the skid resistance of wet pavement surfaces.

Bridge research

The final report on the cooperative dynamic testing of bridges in Iowa was completed and the draft of the report on similar testing in Nebraska has been prepared. Data on Missouri tests have been analyzed by the State and were being checked by the Bureau, making effective use of electronic data reduction equipment. Work on the South Dakota data continued.

The Bureau's electronic field testing equipment was being used on the AASHO Road Test to record the behavior of the test bridges under the passage of test vehicles. These measurements will contribute knowledge on the impact factors applicable to the design of highway bridges and will also record the progressive effects of the repeated application of overloading to the test bridges.

The theoretical studies and laboratory research on dynamic effects on highway bridges being conducted at the University of Illinois were well advanced. The results of this cooperative study were being used in the interpretation and codification of the data from the dynamic tests on the AASHO test road bridges. They will also be applied to the data obtained in earlier tests on bridges in the field as well as on future bridge tests.

Wind tunnel tests on models of overhead and roadside highway signs and their supports have indicated the range in which resonant vibration of such structures may be expected to occur because of the action of wind. From this research a design criterion has been derived for supporting structures, to avoid this serious form of vibration.

Studies have been made and a one-fiftieth scale section model of the proposed San Pedro suspension bridge has been designed at the request of the California Division of Highways. The model will be built and tested in the wind tunnel early in the 1960 fiscal year to determine the aerodynamic characteristics of the bridge and insure its stability in the wind.

Cooperative tests at Lehigh University demonstrated the resistance of a shell-type aluminum bridge to static and dynamic loading and confirmed the

validity of the design analysis employed. It is expected that several bridges of this new type will be erected on an experimental basis to test its suitability and economy under highway loading.

Foreign Activities

The Inter-American Highway

Since 1930 the United States, through the Bureau of Public Roads, has been assisting the Republics of Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama in the construction of the Inter-American Highway, which is that section of the Pan American Highway from Nuevo Laredo on our Mexican border, to Panama City at the Pacific terminal of the Panama Canal, a distance of 3,142 miles. Connecting highways from El Paso and Nogales, Tex., to Mexico City now afford more direct routes from the Western United States.

The section of the highway in Mexico has been financed and constructed entirely by Mexico.

At the end of the year, 95 percent of the Inter-American Highway was passable in all kinds of weather by motor vehicles, but uninterrupted travel to Panama City was still an impossibility. Throughout its length of 1,587 miles in Mexico, the highway was open at all times and practically all of it was paved. From the Guatemala-Mexican border, the highway was also passable at all times over paved or gravel roads for 1,119 miles further south to San Isidro, Costa Rica. In this distance, many sections were under construction, but the route was open and passable without undue difficulty.

Beginning at San Isidro, Costa Rica, a formidable impassable section of the route extended for 149 miles through rough and undeveloped territory to Concepcion, Panama. This entire section was under construction. From Concepcion to Panama City, a distance of 287 miles, the highway was passable at all times but considerable construction was underway.

The condition of the highway and the work accomplished during fiscal year 1959 are described in the following paragraphs.

In Guatemala, the entire highway was passable at all times. The previously impassable gap in the difficult Selegua Canyon, a few miles from the Mexican border, was opened to traffic and has been in continuous use by local and through traffic since October 1958. In the northern section of Guatemala, from the Mexican border to Patzicia, grading and gravel subbase construction was substantially completed and a contract for the paving of this 175-mile section, except for 7 miles in the Selegua Canyon, was awarded. Twenty permanent bridges are still to be completed, but detours or temporary bridges were available in all cases. In southern Guatemala, grading and gravel subbase work was nearing completion. Ten bridges are still to be completed, eight of which are under construction. In all cases, traffic encountered no delays.

In El Salvador, the highway was completed and paved from border to border.

In Honduras, the grading, bridges, and gravel subbase construction were substantially completed during the year. The entire length of highway was scheduled to be ready for paving at the beginning of the next dry season in December.

In Nicaragua, the grading, bridges, and gravel subbase work were also completed during the year on all of the sections that were not previously completed and paved. Contracts were awarded for the paving of a 35-mile section in northern Nicaragua and a 22-mile section in southern Nicaragua. Plans were complete for surfacing the last 48-mile unpaved section of the highway in Nicaragua.

In Costa Rica, the highway from the Nicaragua border to San Ramon, where the previously paved road begins, has been paved except for about 6 miles adjacent to the border. Because the wet season extends from May to November, this short section will not be completed until fall but the highway was passable at all times. In southern Costa Rica, the entire 132-mile section between San Isidro and the Panama border was still under construction in three contracts for grading, drainage, gravel subbase, and five bridges. Fair progress was made during the year despite the rough terrain, excessive rainfall, and difficulty of access. There are still 39 bridges to be constructed before this section will be passable. At the end of the year the first steps toward placing these bridges under contract were taken.

In Panama, the grading, bridges, and gravel subbase were completed on one 33-mile section during the year and a contract for the paving was subsequently awarded. Four contracts for grading, bridges, and gravel base were underway, covering the entire portion of the route in Panama which was not already paved or under contract for paving, except for one 30-mile relocation where an adequate road existed. Arrangements were made near the end of the year to provide for a paved highway from the Costa Rican border to Panama City.

During the year, contracts were awarded for paving 288 miles of the Inter-American Highway. Of the 1,555 miles from the Mexico-Guatemala border to Panama City, 985 miles were either paved or under contract for paving. This left 570 miles on which some construction remained to be done. Grading, bridges, and gravel subbase have been completed or were under construction on all of this except for 30 miles in Panama, and for partial construction on 71 miles in Costa Rica. In addition, there are still 11 bridges in Guatemala, 39 in Costa Rica, and 4 in Panama to be placed under contract. The highway will not be passable throughout Costa Rica until these bridges are built, but in Guatemala and Panama there was no delay to traffic because detours or temporary bridges were available.

Other Latin American projects

In Guatemala, Public Roads continued furnishing technical engineering assistance to the International Cooperation Administration in connection with the construction and improvement of the Pacific Highway, from the Mexican border to the border of El Salvador, and the Atlantic Highway, from Guatemala City to Puertos Barrios, as well as rural development roads.

In Nicaragua, the Bureau of Public Roads continued its technical assistance to the Republic in the planning and construction of their National Highway System (other than the Inter-American Highway), which was being financed in part by a loan from the International Bank for Reconstruction and Development (World Bank). This program ended at the close of the fiscal year.

The United States is also assisting Nicaragua financially in the construction of the Rama Road, extending 158 miles from San Benito on the Inter-American Highway to Rama, a river port on the Escondida River. When completed, it will form the main transportation link from the settled portion of Nicaragua on the Pacific Coast to the large, undeveloped, fertile areas of eastern Nicaragua and the Atlantic Ocean. In order to complete the highway, 20 miles of roadway and eight bridges remain to be placed under contract.

During the year, the Bureau of Public Roads sent a highway design engineer to Colombia on detail for about 30 days to assist the Government of Colombia in establishing a highway design department. Requests for additional technical assistance were received from Costa Rica for a photogrammetric engineer and from Panama and Costa Rica for construction equipment specialists.

Other foreign activities

The Bureau of Public Roads has, since the end of World War II, provided technical assistance, advice, and consultation to many foreign countries in cooperation with the Department of State, the Export-Import Bank, and the International Bank for Reconstruction and Development (World Bank). The objectives of such assistance have been to further the programs of highway improvement and communications in those countries, thus fostering their economic and social growth.

Activities in Ethiopia.—Expenditures and commitments totaling $3.8 million, primarily for equipment procurement, were made out of the $15-million loan obtained from the World Bank in 1957. The highway program financed by this loan was modified by some changes of route locations and by assignment of new priorities to individual roads.

During the fiscal year, ground surveys were begun on approximately 840 miles of high priority roads on which aerial survey and design work had been completed. Four major projects, totaling more than 189 miles, were advertised for bids.

The training of Ethiopian personnel at all levels and in a variety of fields continued. Several positions in the Imperial Highway Authority formerly filled by U.S. personnel, including that of assistant director, were now filled by Ethiopians. At the close of the fiscal year, 20 U.S. engineers and technicians were assigned to the authority.

Activities in Iran.—During the fiscal year, Public Roads provided technical assistance to Iran in the development of good maintenance practices and low-cost road improvement. This consisted primarily of ditching, widening, grading, and placing gravel or crushed stone surfaces. Special projects with bituminous road-mix and penetration surfaces were initiated as demonstrations of two types of dustless surfaces.

Continued cooperation was given to the Iranian Ministry of Roads in the organization and staffing of a highway department, the training of personnel in the operation, maintenance, and repair of modern construction equipment, and the implementation of a highway maintenance program.

Activities in Jordan.—The political instability in the Middle East has created difficulties in continuing a plan of highway development in Jordan. However, a highway system had been defined and effort was being concentrated on development of those portions of the proposed highway system which had potential for greatest immediate benefit in the movement of traffic and commodities.

The Public Roads advisory staff in Jordan assisted in the organization of a highway division within the Ministry of Public Works and directly assisted on special-aid highway construction projects. Technical aid also was provided in the establishment of a heavy-duty equipment repair department.

Special-aid assistance involved construction, by force-account methods, of approximately 185 miles of the highway system, including 80 miles on the primary system, 15 miles on the secondary system, and 90 miles of feeder and village access roads. Of this total 71 miles had been paved.

During October the new 26-mile section of highway between Amman and the Dead Sea was officially opened for traffic. This section required approximately 2.5 million cubic yards of excavation and construction of a 382-foot bridge over the Jordan River.

Major highway construction for the year included grading and crushed-stone surfacing of approximately 12 miles on the primary highway system and 11 miles on the secondary and feeder road system; and application of approxi-

mately 37 miles of penetration-type asphalt surfacing and 6 miles of roadmix-type surfacing on the primary highway system. Extraordinary maintenance work on the Naur-Dead Sea highway, required by storm damage, was also accomplished.

To provide employment for the large refugee population of Jordan, the Bureau of Public Roads was allotted an additional $470,000 for construction of secondary and feeder roads, which began in May 1959.

At the close of the fiscal year, construction was nearing completion on 95 miles of primary, 29 miles of secondary, and 90 miles of feeder and access roads. Surveys and design were in progress for projects to be financed from fiscal year 1960 funds.

Activities in Lebanon.—On July 3, 1958, a division office of the Bureau of Public Roads was established in Beirut, Lebanon, to provide technical assistance in developing the highway program of that country.

Little could be accomplished during the first 6 months due to the armed rebellion and subsequent period of instability. Since January 1959, however, Public Roads maintained steady progress in the accomplishment of its mission. Major objectives were the development of plans for a single highway department, the consolidation of repair facilities, assistance in design, and supervision of construction. Approximately $270,000 of modern highway construction equipment was received during the year and an additional $215,000 was on order. Orders were placed for $100,000 of machine tools, tools, and spare parts as a start on a modern highway repair shop and for the repair and rehabilitation of the large amount of inoperative equipment.

Activities in Liberia.—Public Roads continued its assistance to the Liberian Division of Highways which, during the year, completed construction of 85 miles of surfaced highway and 12 concrete bridges. Location survey or design work was completed on 152 miles of highway. A concrete box-girder bridge 500 feet long was 70 percent complete.

Work in the Western Province was 80 percent complete with $8 million of a $13-million loan from the Export-Import Bank having been expended. An outstanding project completed in this area was the bridge over the St. Paul River. The bridge is a major link between the Liberian highway system and neighboring Sierra Leone. The 147-mile Gbanka-Voinjama-Konjo Highway was scheduled to be completed during fiscal year 1960.

The farm-to-market road program progressed with the completion of a 20-mile section and the start of construction on another road, 58 miles long.

Two Liberians, in training under the assistance program, graduated from American colleges and have assumed positions as Assistant Bridge Engineer and Assistant Materials Engineer with the Liberian Division of Highways.

Activities in Nepal.—The Bureau of Public Roads was providing assistance to Nepal in highway improvement under a joint agreement among the Governments of India, Nepal, and the United States. The program consisted of the improvement of existing roads and construction of others, totaling over 800 miles. The training of a Nepalese staff in modern highway procedures was also one of the principal aims.

The total financing committed to the program was $7.2 million, of which the United States was contributing $5 million through ICA. At the close of the fiscal year, more than $1.7 million had been obligated for commodity purchases.

Many problems were encountered, due to the lack of background in highway construction and engineering methods and the shortage of experienced or trained Nepalese personnel. The Public Roads mission included five engineers and technicians. Two Nepalese engineers were in the United States receiving training in State highway departments.

Activities in the Philippines.—Public Roads has maintained a work group in the Philippine Islands since 1946. Until 1952 its principal concern was reestablishment of a highway organization and restoration of the war-damaged roads and bridges under the Philippine Rehabilitation Act.

Since 1952 the Public Roads group has acted as a consultant and functional agency to the International Cooperation Administration and its predecessors in road matters, and as advisers to the Philippine Bureau of Public Highways. Assistance has been given to the advancement of the nationwide highway program, construction of the Mindanao development roads, replacement of temporary bridges, and development of village and feeder roads.

Commodity support by the United States during the past 8 years has totaled more than $27 million. This has been in the form of construction and maintenance equipment, shop tools, structural plate, culverts, and steel for bridges. Such support during fiscal 1959, due to lessening requirements, was only $400,000, most of which was used for the purchase of asphaltic materials.

During the fiscal year work in the construction of the Mindanao development roads, although hampered by continuous rain, amounted to over $7.5 million. Forty-eight miles of roads and 34 bridges were completed, and at the end of the year 152 miles of roads and 43 bridges were under construction. Only 33 miles of roads and 11 bridges remained to be completed in the program.

Under the village (barrio) and feeder road program, 792 miles were completed and 886 miles were under construction this year. About 236 of the completed miles and 70 of those under construction were self-help roads on which the villagers furnished rights-of-way, labor, and local materials while the government furnished the equipment, fuel oil, operators, and supervision.

The training program for Philippine personnel continued. Ten trainees were sent to the United States during the year for specialized practical work. Instruction and demonstration were given on the operation and maintenance of equipment in many of the provinces and cities of the Islands. Special attention was given to shop management, equipment repairs, and the use of tools.

Activities in the Sudan.—In April 1958, under an agreement with the International Cooperation Administration, the Bureau of Public Roads established a technical assistance mission to the Sudanese Government. At the end of the fiscal year the mission had four engineers and three equipment specialists in the Sudan, with more planned as the program develops.

Two projects were initiated during the year. One, a highway development project, was designed to train Sudanese engineers both on the job and abroad in the fields of highway planning, design, and construction, and to establish a maintenance organization capable of maintaining future construction and improving existing tracks.

The second was a highway construction demonstration project, which will include proven design criteria and construction methods, give needed practical experience to local engineers and technicians, illustrate highway construction costs derived from competitive bids, and provide needed increments to Sudan's highway system. Plans and specifications for this 13-mile demonstration road were completed at the close of the fiscal year.

Activities in Turkey.—In June 1959, the last member of the Public Roads mission left Turkey, thus terminating more than 11 years of technical and administrative assistance to that country. The Turkish Directorate of Highways, at that time, assumed the entire responsibility of administering Turkey's road improvement and maintenance program. The fact that during those 11 years, the directorate was organized, staffed, and trained, and that enabling legislation was enacted, is assurance that the mission was successfully accomplished.

Continued assistance on specific problems will be available to Turkey as the needs may arise.

Miscellaneous activities.—Assistance and advice to the Ministry of Works in British Guiana was continued. Because the shortage of local funds made implementation of recommended road programs extremely difficult, the one Public Roads engineer had returned to the United States.

Preparations were underway by Public Roads to send a six-man team to Laos on a temporary detail to make an inventory of equipment purchased by the International Cooperation Administration, and to assist in getting construction underway on a project extending from the Laotian capital city of Vientiane to the Mekong River. It is anticipated that more extensive assistance by Public Roads will ultimately be provided.

During the year, a team of three Public Roads officials visited Poland for a 3-week period, under the auspices of the State Department, to study their highway system, designs, and techniques.

Consultations were held in Washington, D.C., with officials of the ICA in regard to the formation of a survey group to study the advisability of proposed highway improvements in Yemen. It was anticipated that the Bureau of Public Roads would send a mission of engineers and technicians to that country in the near future.

Training of foreign engineers

Highway officials, engineers, and technicians continued to come to the United States during the year to study the techniques and methods which have been developed in the fields of highway organization, administration, research, design, construction, and maintenance. Public Roads, with the cooperation of the State highway departments, arranged and provided nearly 500 man-months of training for 145 participants from 25 countries, exclusive of the nearly 130 casual visitors and participants whose programs were arranged by other governmental agencies.

Included in the 145 participants were 6 teams, averaging 10 members each, whose programs were of approximately 6 weeks' duration. The average program of individual participants was about 9 months. Although most of the participants were sponsored by the International Cooperation Administration, some were sponsored by nongovernmental organizations or sent by their own governments.

Appendix

LIST OF TABLES

Table 1.—Summaries of programs approved and work completed in the fiscal year 1959, by class of highway and by fund

	PROGRAMS APPROVED [1]						WORK COMPLETED					
	Total cost	Federal funds	Miles	Railway-highway grade crossing improvements			Total cost	Federal funds	Miles	Railway-highway grade crossing improvements		
				Crossings eliminated	Structures reconstructed	Crossings protected				Crossings eliminated	Structures reconstructed	Crossings protected
	BY CLASS OF HIGHWAY						BY CLASS OF HIGHWAY					
Primary-rural, Interstate	$1,580,497,629	$1,400,971,822	2,820.6	91	9	6	$687,671,764	$566,677,071	2,061.3	65	6	2
Primary-rural, all other	854,204,850	459,498,206	7,441.8	84	9	117	794,575,057	427,391,610	9,424.2	107	17	107
Secondary-rural	644,404,841	346,928,568	18,443.0	37	4	281	553,703,552	293,913,498	19,036.5	32	1	224
Urban-Interstate	1,137,903,813	864,960,084	413.0	64	2	6	680,990,428	493,286,701	255.0	79	1	2
Urban, all other	564,653,249	295,282,346	821.6	68	16	56	482,873,726	248,307,038	938.3	108	11	62
Subtotal	4,781,664,382	3,367,641,026	29,940.0	344	40	466	3,199,814,527	2,029,575,918	31,715.3	391	36	397
Not classified [2]	79,057,319	73,263,765	983.4				75,153,103	65,382,534	1,112.8			5
Total	4,860,721,701	3,440,904,791	30,923.4	344	40	466	3,274,967,630	2,094,958,452	32,828.1	391	36	402
	BY FUND						BY FUND					
Federal-aid:												
Primary	$822,362,562	$433,771,324	6,038.6	88	11	128	$781,422,900	$407,093,142	7,135.2	128	18	134
Secondary	595,473,153	314,400,349	16,444.0	39	4	281	504,730,147	260,818,969	16,310.2	32	1	226
Urban	467,749,898	243,014,727	439.9	57	13	44	411,785,484	207,265,179	395.8	95	10	31
Interstate	2,705,371,535	2,259,415,720	3,227.7	153	11	12	1,325,106,938	1,039,300,909	2,289.9	133	6	4
"D" funds	190,707,234	117,038,906	3,789.8	7	1	1	176,769,058	115,097,719	5,584.2	3	1	2
Subtotal	4,781,664,382	3,367,641,026	29,940.0	344	40	466	3,199,814,527	2,029,575,918	31,715.3	391	36	397
Defense access roads	10,929,565	10,298,432	124.7				8,985,822	8,373,329	148.1			5
National forest highway [3]	36,515,307	34,381,569	594.7				21,082,955	20,082,555	429.4			
National park and parkway [4]	23,480,200	23,480,200	173.2				20,321,881	20,321,881	274.3			
Bureau of Land Management [4]							1,615,033	1,615,033	26.5			
Forest development [4]							4,620,385	4,620,385	70.4			
Public lands	2,463,089	2,388,089	34.7				2,854,385	2,681,720	34.0			
Emergency flood relief	5,669,158	2,715,475	56.1				15,672,642	7,687,631	130.1			
Subtotal	79,057,319	73,263,765	983.4				75,153,103	65,382,534	1,112.8			5
Total	4,860,721,701	3,440,904,791	30,923.4	344	40	466	3,274,967,630	2,094,958,452	32,828.1	391	36	402

[1] Initial commitment of funds.
[2] Defense access roads, forest, park, Bureau of Land Management, forest development, public lands, and emergency flood relief projects.
[3] Includes construction projects only.
[4] Construction supervised by Bureau of Public Roads.

Table 2.—Projects under construction or plans approved on June 30, 1959, by class of highway and by fund

	Total cost	Federal funds	Miles	Railway-highway grade crossing improvements		
				Crossings eliminated	Structures reconstructed	Crossings protected
By Class of Highway						
Primary-rural:						
Interstate	$2,648,621,680	$2,337,923,633	4,605.4	226	3	3
All other	1,357,545,881	733,349,809	10,812.0	141	14	108
Secondary-rural	784,257,842	422,839,678	18,393.2	67	6	197
Urban:						
Interstate	2,182,592,895	1,832,339,461	661.5	179	3	6
All other	1,076,235,961	562,380,681	1,317.7	167	18	53
Subtotal	8,049,254,259	5,888,833,262	35,789.8	780	44	367
Not classified [1]	138,416,753	121,396,798	1,577.7	2		1
Total	8,187,671,012	6,010,230,060	37,367.5	782	44	368
By Fund						
Federal-aid:						
Primary	$1,245,071,705	$647,283,753	8,095.2	147	15	124
Secondary	674,236,383	348,030,602	15,235.9	68	7	197
Urban	901,816,645	464,336,112	667.7	136	13	33
Interstate	4,781,894,782	4,144,310,780	5,246.9	401	6	9
"D" funds	446,234,744	284,872,015	6,544.1	28	3	4
Subtotal	8,049,254,259	5,888,833,262	35,789.8	780	44	367
Defense access roads	18,927,095	16,899,265	210.0	1		1
National forest highway [2]	47,462,642	42,415,151	773.0			
National park and parkway [3]	38,881,995	38,881,995	282.6			
Bureau of Land Management [3]	4,324,119	4,324,119	104.6			
Forest development [3]	7,399,322	7,399,322	119.9			
Public lands	2,558,800	2,555,800	26.7			
Emergency flood relief	18,862,780	8,921,146	60.9	1		
Subtotal	138,416,753	121,396,798	1,577.7	2		1
Total	8,187,671,012	6,010,230,060	37,367.5	782	44	368

[1] Defense access roads, forest, park, Bureau of Land Management, forest development, public lands, and emergency flood relief projects.

[2] Includes construction projects only.

[3] Construction supervised by Bureau of Public Roads.

Table 3.—Projects financed with Federal-aid funds programed [1] during the fiscal year ended June 30, 1959, by State

State or territory	Primary			Secondary			Urban			Interstate			Total		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$16, 574, 982	$8, 285, 857	207. 1	$13, 247, 200	$6, 673, 582	698. 3	$1, 606, 200	$814, 860	8. 1	$46, 158, 229	$35, 611, 964	148. 6	$77, 586, 611	$51, 386, 263	1, 062. 1
Alaska	9, 327, 028	8, 909, 006	63. 7	8, 550, 537	8, 178, 973	70. 3	4, 256	4, 153					17, 881, 821	17, 092, 132	134. 0
Arizona	7, 500, 838	6, 008, 823	52. 2	7, 119, 874	5, 210, 950	138. 0	1, 077, 268	814, 224	4. 5	22, 347, 924	21, 092, 526	78. 5	38, 045, 904	33, 126, 523	273. 2
Arkansas	6, 183, 060	3, 393, 071	59. 0	10, 167, 327	5, 096, 985	310. 5	1, 168, 490	612, 567	5. 7	31, 635, 370	28, 513, 608	38. 2	49, 154, 247	37, 616, 231	413. 4
California	50, 297, 243	26, 977, 500	94. 5	24, 985, 876	14, 582, 479	252. 5	42, 845, 603	21, 903, 527	17. 3	361, 083, 219	172, 804, 790	89. 4	479, 211, 941	236, 268, 296	453. 7
Colorado	19, 105, 616	10, 586, 519	141. 5	8, 650, 489	4, 796, 464	177. 0	3, 606, 355	2, 039, 661	5. 2	26, 776, 578	23, 945, 006	92. 0	58, 139, 038	41, 367, 650	415. 7
Connecticut	16, 347, 072	7, 540, 263	13. 5	4, 406, 909	2, 237, 407	16. 7	9, 780, 620	4, 826, 407	6. 1	35, 055, 309	31, 269, 086	17. 9	65, 589, 910	45, 873, 163	54. 2
Delaware	3, 650, 846	1, 821, 223	27. 2	2, 310, 496	1, 226, 148	26. 6	13, 854	6, 927		2, 945, 933	2, 651, 340	2. 7	8, 921, 129	5, 705, 638	56. 5
Florida	13, 203, 105	6, 763, 194	75. 8	15, 534, 867	7, 948, 420	278. 8	6, 199, 991	3, 225, 213	5. 9	72, 149, 176	64, 764, 877	92. 2	107, 087, 139	82, 701, 704	452. 7
Georgia	20, 329, 361	10, 232, 540	142. 6	14. 864, 376	7, 487, 069	338. 6	3, 792, 820	1, 896, 410	7. 4	73, 114, 495	62, 203, 045	101. 0	112, 101, 052	81, 819, 064	589. 6
Idaho	7, 421, 291	4, 942, 531	44. 6	6, 213, 704	3, 878, 737	210. 3	875, 786	782, 043	1. 3	16, 536, 085	15, 407, 884	53. 0	31, 046, 866	25, 011, 195	309. 2
Illinois	35, 358, 934	17, 758, 044	153. 4	19, 860, 572	9, 924, 380	450. 4	31, 349, 771	19, 805, 520	35. 5	132, 590, 369	114, 712, 510	72. 2	219, 159, 646	162, 200, 454	711. 5
Indiana	21, 910, 510	10, 730, 290	121. 3	18, 240, 559	9, 144, 079	170. 0	15, 896, 964	8, 004, 047	17. 1	85, 505, 260	76, 954, 734	84. 3	141, 553, 293	104, 833, 150	392. 7
Iowa	18, 588, 032	9, 791, 459	256. 1	13, 527, 437	6, 855, 333	493. 2	3, 728, 124	2, 479, 977	10. 4	29, 019, 664	26, 263, 447	61. 1	64, 863, 257	45, 390, 216	820. 8
Kansas	19, 730, 240	9, 963, 333	298. 3	15, 102, 878	7, 627, 562	943. 4	5, 236, 540	2, 599, 547	9. 3	28, 726, 815	25, 770, 618	38. 8	68, 796, 473	45, 961, 060	1, 289. 8
Kentucky	21, 383, 084	11, 794, 195	50. 1	13, 721, 372	6, 349, 219	147. 4	9, 632, 302	4, 966, 151	15. 1	71, 542, 254	64, 388, 025	98. 5	116, 279, 012	87, 497, 590	311. 1
Louisiana	16, 334, 752	6, 706, 241	46. 7	19, 443, 562	9, 764, 341	290. 2	6, 322, 998	3, 209, 859	3. 2	41, 961, 302	37, 765, 172	40. 5	84, 062, 614	57, 445, 613	380. 6
Maine	4, 660, 428	2, 330, 189	15. 9	4, 354, 257	2, 185, 405	37. 1	28, 232	14, 116		18, 896, 001	16, 949, 780	24. 5	27, 938, 918	21, 479, 490	77. 5
Maryland	6, 053, 794	3, 125, 797	33. 7	4, 895, 591	2, 372, 009	79. 6	7, 738, 894	3, 944, 892	13. 7	33, 862, 328	30, 536, 335	19. 3	52, 550, 607	39, 979, 033	146. 3
Massachusetts	12, 591, 574	6, 251, 758	11. 4	2, 823, 375	1, 597, 797	7. 4	6, 122, 462	3, 296, 456	5. 4	81, 099, 824	72, 454, 991	42. 3	102, 637, 235	83, 601, 002	66. 5
Michigan	18, 389, 204	9, 206, 204	208. 8	16, 660, 210	8, 407, 254	594. 8	37, 500, 551	18, 142, 049	18. 4	107, 591, 887	96, 197, 493	84. 1	180, 141, 852	131, 953, 000	906. 1
Minnesota	19, 846, 663	10, 202, 940	200. 1	17, 411, 479	9, 084, 887	1, 187. 0	9, 952, 876	5, 225, 253	17. 4	37, 811, 579	33, 842, 284	22. 9	85, 022, 597	58, 355, 364	1, 427. 4
Mississippi	12, 126, 154	6, 035, 727	163. 0	14, 953, 904	6, 768, 959	498. 4	4, 216, 671	2, 115, 235	8. 5	37, 958, 113	34, 167, 838	122. 3	69, 254, 842	49, 087, 759	792. 2
Missouri	26, 165, 660	13, 374, 753	128. 1	20, 844, 171	10, 444, 747	1, 124. 8	7, 302, 833	3, 943, 693	6. 5	50, 302, 374	45, 295, 132	76. 5	104, 615, 038	73, 058, 325	1, 335. 9
Montana	15, 228, 401	9, 470, 088	190. 0	11, 374, 199	7, 315, 978	294. 2	111, 650	63, 099	. 2	29, 003, 881	26, 745, 749	72. 3	55, 718, 131	43, 594, 914	556. 7
Nebraska	12, 235, 583	6, 375, 014	164. 1	15, 090, 527	7, 607, 671	410. 9	2, 571, 590	1, 349, 675	3. 7	16, 092, 834	14, 355, 635	14. 4	45, 990, 534	29, 687, 995	593. 1
Nevada	4, 164, 789	3, 467, 621	57. 2	4, 186, 335	3, 468, 475	85. 2	25, 526	23, 589	. 1	14, 857, 858	14, 114, 964		23, 234, 508	21, 074, 649	142. 5
New Hampshire	3, 364, 283	1, 680, 608	10. 4	3, 686, 756	1, 824, 340	16. 2	1, 784, 656	693, 650	. 7	19, 150, 497	16, 951, 981	23. 3	27, 986, 192	21, 150, 579	50. 6
New Jersey	14, 745, 946	7, 362, 524	19. 3	5, 158, 888	2, 579, 444	27. 4	20, 322, 052	10, 031, 027	10. 4	59, 323, 326	52, 989, 036	24. 6	99, 550, 212	72, 962, 031	81. 7
New Mexico	9, 242, 164	5, 828, 938	75. 2	9, 180, 178	5, 735, 651	191. 0	1, 911, 335	1, 193, 448	2. 3	28, 125, 272	26, 135, 692	102. 3	48, 458, 949	38, 893, 729	370. 8
New York	43, 132, 481	20, 451, 215	183. 8	24, 731, 324	11, 709, 840	171. 8	82, 269, 577	39, 677, 187	39. 5	170, 768, 340	144, 127, 101	36. 6	320, 901, 722	215, 965, 343	431. 7
North Carolina	13, 547, 130	6, 796, 740	80. 1	18, 877, 296	9, 532, 588	594. 2	2, 784, 552	1, 704, 596	3. 1	27, 546, 212	24, 791, 571	125. 1	62, 755, 190	42, 825, 495	802. 5

North Dakota	11,525,044	6,000,034	208.2	9,504,724	4,778,754	998.0	889,728	558,284	1.4	14,038,150	12,647,977	73.9	35,957,646	23,985,049	1,281.5
Ohio	42,142,857	21,597,694	76.1	17,986,682	9,911,574	78.0	35,318,044	19,867,234	12.8	182,572,245	162,615,587	125.1	278,019,828	213,992,089	292.0
Oklahoma	15,314,983	7,586,020	125.6	16,168,989	8,121,493	466.8	6,518,247	3,376,638	15.2	20,494,308	18,438,766	48.2	58,496,527	37,522,917	655.8
Oregon	12,464,583	7,674,758	83.6	10,005,596	6,076,251	176.2	2,669,340	1,693,000	3.0	52,865,144	48,594,000	144.4	78,004,663	64,038,009	407.2
Pennsylvania	30,007,642	15,003,821	37.7	4,519,189	2,204,611	23.5	15,464,922	7,619,461	12.0	71,367,307	64,167,578	51.8	121,359,060	88,995,471	125.0
Rhode Island	923,656	455,133	1.5	3,084,736	1,542,368	12.7	4,513,292	2,256,646	.6	12,893,196	11,603,876	.5	21,414,880	15,858,023	15.3
South Carolina	6,082,471	3,212,136	71.3	10,399,385	5,258,493	628.8	1,287,648	643,824	3.4	25,074,285	22,621,757	85.1	42,843,789	31,736,210	788.6
South Dakota	15,152,430	8,410,780	433.4	10,263,560	5,802,554	636.1	711,823	394,990	1.3	13,563,661	12,356,495	24.7	39,691,474	26,964,819	1,095.5
Tennessee	14,069,216	7,041,627	78.8	16,686,402	8,351,840	619.1	8,184,779	4,094,962	4.2	98,418,362	88,580,862	108.9	137,358,759	108,069,291	811.0
Texas	61,399,258	31,264,300	907.2	32,182,112	16,307,950	918.6	27,779,262	14,371,480	77.6	126,644,903	113,716,386	194.0	248,005,535	175,660,116	2,097.4
Utah	7,332,946	5,602,729	49.8	3,808,920	2,833,103	76.7	1,169,701	862,849	1.3	21,646,263	20,437,551	47.6	33,957,830	29,736,232	175.4
Vermont	7,455,487	3,724,452	28.9	3,154,074	1,572,315	38.3	794,435	395,694	.8	22,261,716	20,029,837	19.1	33,665,712	25,722,298	87.1
Virginia	9,538,144	5,101,591	96.8	13,067,782	6,974,499	273.8	3,370,482	1,824,314	6.8	43,838,374	39,266,360	51.5	69,814,782	53,166,764	428.9
Washington	11,720,912	6,566,060	105.7	8,666,187	4,426,075	252.8	9,068,947	4,914,437	2.3	47,291,109	42,011,218	34.6	76,747,155	57,917,790	395.4
West Virginia	12,698,162	6,355,050	16.3	12,288,919	6,151,546	273.2	2,124,228	1,065,758	1.0	54,296,871	48,643,260	40.0	81,408,180	62,215,614	330.5
Wisconsin	19,006,614	9,455,996	218.7	13,601,996	6,893,933	474.4	13,623,419	6,324,333	4.0	51,127,022	45,174,034	154.8	97,359,051	67,848,296	851.9
Wyoming	7,773,148	5,007,862	88.0	6,367,738	4,108,742	126.4	868,713	559,220	4.8	22,029,379	20,419,015	121.9	37,038,978	30,094,839	341.1
District of Columbia	3,982,888	2,193,804	4.1	5,955,641	2,192,338	3.8	4,050,261	2,016,580	4.0	15,410,932	14,316,947	2.2	29,399,722	20,719,669	14.1
Hawaii	7,019,639	3,373,402	4.5	415,824	182,541	.7	398,464	199,184	1.1	----------	----------	------	7,833,927	3,755,127	6.3
Puerto Rico	8,012,234	3,979,870	13.7	7,168,172	3,092,196	33.9	1,162,764	566,781	.3	----------	----------	------	16,343,170	7,638,847	47.9
Total	822,362,562	433,771,324	6,038.6	595,473,153	314,400,349	16,444.0	467,749,898	243,014,727	439.9	2,705,371,535	2,259,415,720	3,227.7	4,590,957,148	3,250,602,120	26,150.2

[1] Initial commitment of funds.

Table 4.—Projects involving Federal funds awarded to contract [1] during the fiscal year ended June 30, 1959, by program and by State

State or territory	Tota cost	Total Federal funds	Federal-aid funds				Access funds	Miles
			Primary [2]	Secondary	Urban [3]	Interstate		
Alabama	$67,047,022	$52,429,449	$3,899,606	$5,954,471	$419,833	$41,822,539	$333,000	908.6
Alaska	13,139,700	11,062,869	7,353,840	3,701,904	7,125			110.1
Arizona	38,363,936	33,756,905	6,444,652	4,187,868	802,641	22,311,744	10,000	265.8
Arkansas	38,592,604	25,987,961	5,768,426	3,658,719	2,284,645	14,276,171		372.3
California	410,907,294	197,612,448	22,461,647	10,836,746	12,280,135	151,311,672	722,248	442.7
Colorado	52,968,795	38,585,101	7,784,433	5,269,862	903,426	24,627,380		365.6
Connecticut	39,672,865	22,402,986	4,197,405	1,507,407	7,953,399	8,744,775		34.8
Delaware	11,922,800	8,348,000	1,778,000	1,611,000		4,959,000		54.4
Florida	119,092,388	91,714,918	5,868,187	5,799,712	7,569,247	72,043,824	433,948	381.8
Georgia	112,402,587	78,384,235	12,535,931	6,929,301	4,576,108	53,872,028	470,867	495.7
Idaho	30,444,905	24,720,403	4,562,021	3,263,274	688,676	16,203,432	3,000	268.9
Illinois	231,276,606	167,562,182	20,482,588	13,934,001	22,519,451	110,608,142	18,000	968.8
Indiana	132,802,565	93,697,237	11,415,689	10,037,515	6,904,014	65,312,519	27,500	351.5
Iowa	96,069,366	72,582,915	10,224,135	7,577,987	1,850,359	52,930,434		1,045.4
Kansas	64,456,953	44,006,068	9,036,515	7,328,300	1,310,619	26,101,663	228,971	1,381.6
Kentueky	100,373,580	76,438,523	8,656,496	6,881,144	2,098,561	58,802,322		265.1
Louisiana	106,785,834	72,831,283	7,395,321	12,217,661	5,701,419	47,125,802	391,080	569.0
Maine	30,446,654	23,602,859	1,900,478	2,437,431	376,621	18,839,444	48,885	98.5
Maryland	38,259,138	25,275,438	3,294,605	4,017,220	6,728,542	11,202,171	32,900	238.2
Massaehusetts	90,687,018	70,945,551	6,423,169	2,153,045	4,849,804	56,960,373	559,160	52.9
Michigan	164,117,047	124,949,359	9,045,779	7,412,223	10,266,797	97,787,240	437,320	871.9
Minnesota	96,677,168	67,178,709	11,556,565	9,020,043	5,939,117	40,653,984	9,000	1,459.6
Mississippi	59,252,031	39,361,580	8,269,465	6,277,849	1,220,779	23,593,487		767.0
Missouri	93,510,541	66,216,662	11,856,479	8,333,221	3,521,524	42,503,738	1,700	1,159.6
Montana	42,372,469	32,313,928	7,689,467	7,054,369	63,099	17,493,493	13,500	479.4
Nebraska	45,450,808	30,468,507	4,227,295	8,011,039	1,405,321	16,824,852		590.3
Nevada	29,967,291	27,564,960	4,022,628	3,009,891	55,809	20,476,632		163.4
New Hampshire	33,421,430	25,955,245	1,460,326	1,658,398	978,739	21,857,782		54.9
New Jersey	77,877,202	56,155,529	7,327,704	2,398,289	5,718,917	40,710,619		75.7
New Mexico	46,431,738	37,648,713	5,839,532	4,755,052	988,737	26,065,392		349.9
New York	321,902,642	222,567,049	19,261,418	9,508,521	35,925,901	157,434,246	436,963	379.7
North Carolina	55,367,596	41,060,546	4,613,296	5,274,446	1,256,835	29,915,969		454.5

North Dakota	45,599,009	32,929,912	5,795,818	4,832,586	834,774	21,130,404	336,330	1,375.7
Ohio	276,328,856	213,476,472	26,000,404	9,632,552	8,988,528	168,834,272	20,716	319.6
Oklahoma	62,212,122	42,508,197	6,933,639	8,098,231	1,874,049	25,572,670	29,608	592.4
Oregon	75,590,692	62,732,490	7,191,125	4,868,791	2,229,634	48,369,940	73,000	429.8
Pennsylvania	163,635,750	118,963,616	11,341,762	7,111,386	16,652,558	83,822,410	35,500	242.3
Rhode Island	20,392,927	13,098,556	2,268,946	2,069,588	2,156,646	6,586,376	17,000	21.4
South Carolina	55,841,764	42,836,978	2,382,629	4,754,759	2,735,444	32,634,946	329,200	770.6
South Dakota	40,499,600	29,196,383	6,572,942	4,790,680	829,877	16,916,714	86,170	971.5
Tennessee	91,616,061	69,027,440	5,489,535	5,769,225	5,570,564	52,198,116		664.7
Texas	259,218,208	183,574,999	34,060,600	14,348,700	15,059,243	118,367,556	1,738,900	2,106.7
Utah	30,473,029	26,785,693	2,471,724	3,479,675	919,641	19,863,653	51,000	208.3
Vermont	33,067,122	25,876,159	2,963,568	1,472,460	395,695	21,004,436	40,000	71.8
Virginia	75,689,351	58,119,713	6,396,808	5,096,164	3,957,776	42,567,884	101,081	211.4
Washington	69,460,708	52,701,653	5,544,570	4,911,924	4,510,857	37,633,289	101,013	387.5
West Virginia	77,813,968	60,437,893	5,963,623	4,631,967	1,525,822	48,286,481	30,000	155.6
Wisconsin	94,623,687	65,955,199	9,664,572	6,156,654	5,605,023	44,402,542	126,408	862.7
Wyoming	34,400,821	28,497,231	4,430,799	2,971,996	323,878	20,750,558	20,000	228.2
District of Columbia	18,825,936	11,090,504	2,266,379	1,900,238	1,059,980	5,863,907		10.4
Hawaii	9,555,607	4,549,044	2,685,902	983,121	880,021			8.5
Puerto Rico	18,186,898	8,582,095	3,376,292	2,815,007	2,390,796			37.4
Total	4,445,092,689	3,154,328,345	410,454,735	292,713,613	235,667,006	2,208,179,023	7,313,968	25,154.1

[1] Includes preliminary engineering, right-of-way, and force-account projects on which work was started during the fiscal year.

[2] Funds available for either rural or urban portions of the Federal-aid primary highway system.

[3] Funds available for primary system or urban extensions of secondary system.

Table 5.—Status of Federal-aid projects [1] as of June 30, 1959, and projects completed during the fiscal year

State or territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$69,132,082	$44,437,473	344.1	$27,752,944	$19,454,371	231.4	$130,527,062	$96,743,087	1,115.9	$49,321,966	$29,858,033	1,013.4
Alaska	15,387,448	15,332,476	146.3	3,500,750	6,13-,000	77.4	22,240,995	17,882,400	170.2	8,320,913	7,628,484	279.4
Arizona	16,058,988	14,277,930	100.7	10,202,888	9,358,584	46.1	52,071,112	46,409,410	273.8	32,137,279	27,373,519	236.8
Arkansas	50,719,542	40,461,760	387.6	10,176,600	8,253,483	43.6	95,987,852	71,999,462	628.0	24.935,789	14,699,021	595.5
California	91,870,276	63,055,805	284.7	60,678,887	32,492,367	59.2	418,870,040	269,393,951	378.2	440,603,031	246,411,983	595.6
Colorado	16,642,347	10,705,398	134.4	5,330,984	3,680,957	41.8	53,046,454	38,499,297	372.2	70,656,736	51,003,633	453.2
Connecticut	5,540,000	4,390,000	6.0	33,032,786	26,464,656	18.6	81,651,503	50,280,701	82.5	31,070,195	22,058,718	37.8
Delaware	9,003,345	7,796,141	9.3	4,884,474	3,734,491	7.9	28,741,900	21,039,103	77.8	7,273,944	3,862,086	49.1
Florida	30,168,400	21,423,074	223.3	25,316,697	20,194,594	48.2	139,038,670	107,719,771	441.7	62,870,757	44.845,130	545.8
Georgia	112,934,331	86,773,199	606.6	12,572,888	10,285,316	40.8	219,308,528	146,359,619	1,300.4	40,858,462	22,807,112	544.9
Idaho	11,509,227	9,173,383	114.5	5,314,926	4,920,184	24.2	49,892,883	39,762,756	449.9	18,006,344	12,284,764	268.3
Illinois	91,762,053	62,790,973	464.0	61,462,293	45,620,116	97.7	403,214,453	301,040,869	1,349.2	124,060,152	78,867,335	1,018.3
Indiana	71,541,503	52,184,066	164.5	54,298,575	40,806,653	209.0	159,118,546	111,440.547	513.7	55,188,825	31,242,511	542.3
Iowa	21,786,629	17,749,169	172.9	19,056.485	16.562,231	67.7	103,649,929	78,558,334	1,084.1	92,041.697	61,871,097	1,771.7
Kansas	25,133,387	18,067,218	609.2	10,066,631	5,952,244	133.4	76,653,477	53,243,487	1,577.6	80,982,930	55,781,363	1,775.0
Kentucky	46,467,632	34,588,631	98.6	8,545,125	7,457,630	9.5	168,781,963	126,650,369	494.7	32,338,247	19,500,138	187.7
Louisiana	22,665,347	16,250,470	64.1	25,146,471	17,002,400	68.5	185,580,687	134,773,013	876.4	53,223,806	27,767,635	472.6
Maine	6,111,700	4,252,530	7.0	5,045,245	4,396,402	11.7	48,606,688	36,766,373	154.6	14,621,065	9,377,223	92.3
Maryland	42,165,100	32,408,730	65.6	6,096,123	4,204,475	19.1	83,099,286	57,635,236	263.5	46,958,013	32,546,131	186.8
Massachusetts	31,217,875	26,921,465	22.1	64,035,419	47,235,780	33.4	178,518,165	131,545,736	118.4	33,273,487	19,080,501	36.0
Michigan	79,265,784	54,884,429	550.6	45,507,810	35,143,047	120.9	221,194,225	169,064,063	728.3	110,572,554	74,394,995	1,020.4
Minnesota	3,894,077	3,439,381	13.2	12,908,284	9,533,387	75.2	183,472,865	136,904,302	1,682.7	52,181,232	29,696,686	1,888.9
Mississippi	53,525,223	41,090,016	564.8	16,155,900	10,046,254	100.4	117,268,241	84,507,326	1,247.3	37,684,478	21,877,486	833.8
Missouri	33,382,785	20,782,550	1,138.4	22,658,242	15,626,056	78.4	160,511,864	115,913,375	1,182.8	86,981,479	58,314,115	1,308.7
Montana	15,497,580	11,709,962	165.6	9,256,490	7,464,774	69.7	76,484,717	59,154,399	783.8	29,611,187	20,530,408	417.3
Nebraska	7,976,211	4,426,783	153.8	13,974,844	10,154,868	70.7	78,607,385	54,357,392	1,167.7	43,274,298	24,350,276	923.1
Nevada	1,237,199	1,057,618	14.7	2,105,330	1,756,888	31.7	43,646,532	40,512,411	163.5	21,203,900	18,421,872	286.1
New Hampshire	4,643,968	3,562,092	10.0	7,691,744	6,255,348	12.0	40,751,566	31,969,560	79.4	20,054,366	12,392,876	64.4

New Jersey	26,254,007	18,186,705	67.3	45,174,577	30,281,357	26.3	142,360,302	103,402,335	124.7	44,495,190	29,548,154	47.2
New Mexico	13,569,438	11,645,548	61.6	1,078,277	1,000,768	2.5	50,702,426	41,711,072	332.7	51,079,679	41,153,334	444.6
New York	45,684,267	31,158.780	101.2	81,447,724	50,260,062	108.4	742,589,833	515,981,325	724.9	169,889,964	89,248,010	303.3
North Carolina	45,751,399	32,564,349	509.2	13,807,390	10,659,615	80.4	88,173,869	63,520,677	706.2	84,246,115	54,904,319	1,065.8
North Dakota	11,524,389	7,568,394	899.9	11,160,200	8,653,599	90.9	49,179,221	35,668,205	1,326.0	44,394,906	30,387,637	1,869.4
Ohio	32,398,438	19,135,628	67.5	21,316,881	11,043,413	33.7	408,017,221	319,616,764	737.6	198,929,480	134,432,455	726.2
Oklahoma	35,072,642	22,586,203	521.3	27,378,252	20,147,736	140.6	77,854,118	57,456,906	622.8	72,620,252	48,061,238	835.2
Oregon	20,532,594	16,157,143	113.4	13,082,752	10,659,556	54.3	96,339,593	79,820,068	451.8	32,821,712	24,392,852	367.1
Pennsylvania	54,723,995	38,426,201	70.0	18,719,600	11,096,920	20.3	361,646,036	263.969,556	612.9	160,590,207	97,346,706	241.6
Rhode Island	9,046,000	6,753,000	10.2	4,118,046	2,074.488	7.8	34,992,550	24,385,019	43.6	18,296,228	13,436,980	47.6
South Carolina	29,582,178	18,472,895	476.2	16,271,490	11,796,404	77.4	104,319,251	79,165,891	1,470.4	34,851,374	21,050,818	607.8
South Dakota	51,542,099	41,962,471	579.5	6,593,179	3,658,541	169.0	50,226,946	39.221,144	825.3	23,986,626	14,940,622	1,195.3
Tennessee	78,894,899	61,693,653	491.6	20,108,485	17,152,377	35.4	182,121,700	135,816,403	905.4	57,971,548	31,013,987	851.0
Texas	99,034,900	83,899,570	438.5	42,619,387	31,889,880	104.3	343,067,796	254,774,909	2,270.2	196,747,705	133,170,851	2,709.9
Utah	16,660,820	15,162,069	92.9	16,197,390	14,036,073	65.1	42,942,123	38,087,409	210.8	28,007,878	23,401,754	224.0
Vermont	12,522,500	10,798,450	30.3	2,323,512	1,161,756	9.4	47,577,121	37,480,310	101.1	10,884,411	6,338,856	52.5
Virginia	43,357,461	34,096,230	242.4	12,226,519	9,052,349	87.9	126,679,443	100,383,687	373.9	57,575,277	35,104,345	633.4
Washington	28,631,693	21,269,314	203.9	6,668,924	4,332,650	16.5	113,378,702	89,424,931	408.5	54,185,888	37,108,734	656.5
West Virginia	51,711,443	39,008,588	151.5	19,585,130	13,395,959	178.4	90,813,148	67,694,681	125.5	27,387,315	15,144,820	168.9
Wisconsin	38,891,091	28,432,678	424.8	24,071,304	18,403,088	127.6	115,082,364	80,212,465	799.9	63,855,685	41,143,228	924.6
Wyoming	14,040,400	11,159,606	170.4	3,613,676	2,615,171	37.8	69,886,927	59,807,659	420.2	20,876,198	15,922,839	238.1
District of Columbia	25,265,030	19,971,475	11.6	8,185.235	5,107,600	2.2	44.017,298	31,639,006	13.8	7,761,203	4,835,525	8.0
Hawaii	5,017,310	2,508,655	6.7	398,119	172,774	1.0	13,414,238	6,795,867	16.4	4,704,050	2,358,909	14.1
Puerto Rico	18,072,120	8,726,460	33.7	1,526,330	756,130	.6	32,886,231	16,006,802	80.9	13,348,504	6,283,814	38.0
Total	1,795,021,152	1,325,336,787	12,412.2	1,000,448,214	716,663,822	3,326.0	7,048,806,045	5,172,169,440	32,463.8	3,199,814,527	2,029,575,918	31,715.3

[1] Includes projects financed by Federal-aid primary, secondary, urban, "D", and Interstate funds.

[2] Initial commitment of funds.

Table 6.—Mileage of Federal-aid highway projects completed during fiscal year 1959, by program and by number of lanes

State or territory	Primary program			Secondary program [1]	Urban program			Interstate program			"D" program		
	2 lanes	4 lanes	6 lanes or more		2 lanes	4 lanes	6 lanes or more	2 lanes	4 lanes	6 lanes or more	2 lanes	4 lanes	6 lanes or more
Alabama	147.7	80.2		623.2	6.5	8.0			26.8		95.0	26.0	
Alaska	57.4			217.5							4.5		
Arizona	58.2	6.7		48.6	.5	5.3	2.0	37.0	48.1	0.4	28.3	1.7	
Arkansas	66.3	4.0		318.4	.1	4.2		13.3	7.4		181.8		
California	20.9	71.0	4.0	256.3		11.7	16.9	11.9	85.8	15.8	97.8	3.5	
Colorado	66.2	29.2		156.8		3.9		31.2	76.9	2.7	85.1	1.2	
Connecticut	2.8	.3		6.3	.2	3.4		9.1	4.5	.6	2.4	8.1	
Delaware	1.0	12.0		31.4		1.0			.7	.3	2.7		
Florida	6.9	39.2		207.3		6.1			10.1	.9	267.9	7.4	
Georgia	142.6	10.5		375.7		.7	.4		7.4	.8	6.8		
Idaho	79.8	4.2		131.8		2.0		7.3	7.2		36.0		
Illinois	231.8	8.3		564.9	5.0	9.7	1.0		21.7	2.4	171.7	1.8	
Indiana	272.5	41.0		144.7	.3	2.5	3.7		.3		70.1	7.2	
Iowa	345.5	5.9		1,025.0		14.3			156.0		218.5	6.5	
Kansas	352.1	9.7		1,012.8		4.9			154.7	5.4	233.1	2.3	
Kentucky	37.9	5.4		115.7	.8	1.0			13.0		13.9		
Louisiana	174.0	22.4	2.6	223.9		8.0	2.2	.2	1.7		37.7		
Maine	25.8			39.6	.9	2.9			7.7		15.4		
Maryland	19.7	10.4		130.3		3.0	.1	.1	23.0				
Massachusetts	9.5	4.3		7.7		2.8	5.9			5.8			
Michigan	255.2	56.5	3.0	468.3		11.1	4.9		41.0	4.4	169.1	2.1	4.8
Minnesota	260.6	40.2		1,299.1	4.0	21.9	.1	7.9	11.9		243.2		
Mississippi	181.3	1.3		568.2	4.4	3.4	.9	1.6	22.3		50.4		
Missouri	133.6	16.5		813.7	1.4	1.8		.5	18.7	4.9	303.9	13.6	
Montana	107.0	.6		228.1	1.6	.1		20.3			59.7		
Nebraska	313.1	3.7		555.0	.5	3.0			10.6		37.3		
Nevada	34.1	.7		180.2	.3				20.4		50.5		
New Hampshire	25.7			25.0		.8			8.2		4.8		
New Jersey	1.1	12.4		11.7		7.1	3.5		2.3	7.4	1.6		
New Mexico	67.0	19.9		152.2	2.9	3.0		10.9	133.2		55.4		
New York	145.6	27.4	1.4	35.2	9.4	27.2	9.1		1.9	4.6	37.4	4.2	
North Carolina	215.6	85.4		336.9	3.5	3.3	1.1	24.8	185.5	.7	183.6	25.3	

North Dakota	390.5	.3		1,299.6	1.2			44.2	73.7		60.0		
Ohio	90.4	33.5		79.3	.7	2.7	2.7	.1	57.7	2.6	405.2	50.2	1.1
Oklahoma	96.8	24.1		449.8	6.5	8.4		17.6	80.5		138.2	13.2	
Oregon	58.4	2.6		172.2	1.4	1.9			86.5	.1	40.4	3.5	
Pennsylvania	52.8	38.8		75.8	1.8	11.6	4.0		48.9		7.8		
Rhode Island	2.4	3.9		5.5		.9			7.5	1.4	9.2	16.8	
South Carolina	48.2	53.3		444.6		8.6		.1	9.7		40.2	3.0	
South Dakota	364.6	7.4		591.7	.1	1.4			7.2		218.8	4.0	
Tennessee	127.1	8.4		533.3		7.2	.8		9.1	.4	145.5	19.3	
Texas	447.7	161.7		1,191.6		18.0	8.1	17.8	223.5	13.0	607.2	21.5	
Utah	48.7	5.5		111.2			1.0		9.6	4.5	34.2	4.3	5.0
Vermont	14.2			22.1					5.3		10.9		
Virginia	34.5	32.2	2.0	170.3	2.5	4.7	1.3		19.6		360.6	5.7	
Washington	85.8	26.2		244.7	8.6	4.2	.7	.2	71.4	7.1	193.7	14.0	
West Virginia	22.7	2.9		36.5		1.9					104.9		
Wisconsin	173.0	87.7		439.3	1.4	7.0	.4		81.3	.9	132.5	1.1	
Wyoming	68.1	6.0		98.3		.6		17.9	28.1		19.0		
District of Columbia			2.5	1.5				.1		.1	2.4	1.5	
Hawaii	3.1			2.5		.6					6.6	1.4	
Puerto Rico	5.8	2.6		28.9		.7							
Total	5,993.3	1,126.4	15.5	16,310.2	66.5	258.5	70.8	274.1	1,928.6	87.2	5,302.9	270.4	10.9

[1] Total mileage completed, principally two-lane construction.

Table 7.—Lane classification of mileage of Federal-aid highway projects completed during fiscal year 1959, by class of fund

Number of lanes	Mileage							Total lane miles
	Primary	Secondary	Urban	Interstate	"D" funds			Total
					Primary	Secondary	Urban	
2-lane	5,993.3	[1] 16,310.2	66.5	274.1	2,474.6	[1] 2,785.4	42.9	27,947.0	55,894.0
4-lane	1,126.4		258.5	1,928.6	186.4		84.0	3,583.9	14,335.6
6 lanes and over	15.5		70.8	87.2	7.7		3.2	184.4	1,106.4
Total	7,135.2	16,310.2	395.8	2,289.9	2,668.7	2,785.4	130.1	31,715.3	[2] 71,336.0

[1] Total mileage completed, principally 2-lane construction.
[2] 6-lane-and-over mileage was all converted to lane miles on the basis of 6 lanes.

Table 8.—Apportionment of Federal-aid highway funds authorized for the fiscal year ending June 30, 1960

State or territory	Primary ($405,000,000)	Secondary ($270,000,000)	Urban ($225,000,000)	Subtotal ($900,000,000)	Interstate ($2,500,000,000)	Total ($3,400,000,000)
Alabama	$8,469,362	$6,592,841	$2,950,179	$18,012,382	$49,053,500	$67,065,882
Alaska	8,218,724	5,542,560	68,597	13,829,881		13,829,881
Arizona	5,996,337	4,085,495	875,884	10,957,716	33,979,250	44,936,966
Arkansas	6,583,414	5,301,696	1,259,703	13,144,813	24,700,875	37,845,688
California	19,253,224	9,970,730	20,017,148	49,241,102	252,779,750	302,020,852
Colorado	7,296,201	4,873,071	1,871,511	14,040,783	19,278,125	33,318,908
Connecticut	2,663,057	1,343,250	4,361,125	8,367,432	30,347,500	38,714,932
Delaware	2,014,875	1,343,250	461,821	3,819,946	8,756,000	12,575,946
Florida	6,494,165	4,241,949	4,037,855	14,773,969	64,451,125	79,225,094
Georgia	9,758,649	7,490,264	3,281,756	20,530,669	60,023,375	80,554,044
Idaho	4,903,923	3,454,901	433,379	8,792,203	17,163,750	25,955,953
Illinois	15,469,427	8,378,987	15,748,139	39,596,553	127,559,000	167,155,553
Indiana	9,501,715	6,553,248	5,387,263	21,442,226	71,739,500	93,181,726
Iowa	9,441,047	6,938,932	2,673,360	19,053,339	23,606,375	42,659,714
Kansas	9,321,281	6,547,253	2,116,486	17,985,020	22,263,125	40,248,145
Kentucky	7,443,339	6,197,819	2,338,487	15,979,645	43,730,250	59,709,895
Louisiana	6,339,810	4,590,541	3,300,922	14,231,273	65,694,875	79,926,148
Maine	3,342,634	2,396,608	941,127	6,680,369	12,785,750	19,466,119
Maryland	3,735,897	2,289,320	3,821,768	9,846,985	56,043,375	65,890,360
Massachusetts	5,260,749	1,965,695	9,372,665	16,599,109	69,276,875	85,875,984
Michigan	12,594,665	7,674,351	10,480,583	30,749,599	97,758,750	128,508,349
Minnesota	10,355,963	7,320,762	3,666,858	21,343,583	46,889,375	68,232,958
Mississippi	7,055,034	5,922,692	1,246,735	14,224,461	27,312,750	41,537,211
Missouri	11,399,015	7,716,887	5,545,683	24,661,585	70,968,375	95,629,960
Montana	8,085,812	5,565,393	530,251	14,181,456	28,282,875	42,464,331
Nebraska	7,838,474	5,564,315	1,320,714	14,723,503	15,347,875	30,071,378
Nevada	5,061,574	3,383,408	171,498	8,616,480	13,009,625	21,626,105
New Hampshire	2,014,875	1,343,250	666,878	4,025,003	13,681,250	17,706,253
New Jersey	5,488,333	1,904,658	9,857,490	17,250,481	80,495,500	97,745,981
New Mexico	6,437,821	4,427,371	739,021	11,604,213	29,800,250	41,404,463
New York	19,240,954	7,690,809	30,098,912	57,030,675	123,205,875	180,236,550
North Carolina	10,148,366	8,670,582	2,893,630	21,712,578	13,482,250	35,194,828

North Dakota	5,587,148	4,078,803	380,768	10,046,719	11,019,625	21,066,344
Ohio	14,262,863	8,669,644	13,031,005	35,963,512	162,035,750	197,999,262
Oklahoma	8,567,540	6,144,465	2,460,200	17,172,205	22,611,375	39,783,580
Oregon	6,789,530	4,751,847	1,805,637	13,347,014	43,108,375	56,455,389
Pennsylvania	16,348,105	9,740,763	17,047,463	43,136,331	101,440,250	144,576,581
Rhode Island	2,014,875	1,343,250	1,609,763	4,967,888	11,591,750	16,559,638
South Carolina	5,371,134	4,471,235	1,549,021	11,391,390	20,497,000	31,888,390
South Dakota	6,110,574	4,378,434	437,373	10,926,381	10,547,000	21,473,381
Tennessee	8,695,095	6,797,764	3,256,285	18,749,144	73,779,250	92,528,394
Texas	25,923,679	17,357,454	10,787,830	54,068,963	112,385,250	166,454,213
Utah	4,578,378	3,027,907	954,172	8,560,457	23,258,125	31,818,582
Vermont	2,014,875	1,343,250	350,624	3,708,749	23,457,125	27,165,874
Virginia	7,700,108	5,993,444	3,511,499	17,205,051	105,395,375	122,600,426
Washington	6,735,213	4,498,385	3,397,755	14,631,353	45,048,625	59,679,978
West Virginia	4,441,552	3,872,486	1,465,533	9,779,571	31,168,375	40,947,946
Wisconsin	9,409,770	6,572,828	4,409,572	20,392,170	26,193,375	46,585,545
Wyoming	5,032,059	3,411,137	244,844	8,688,040	25,845,125	34,533,165
District of Columbia	2,014,875	1,343,250	1,945,390	5,303,515	24,651,125	29,954,640
Hawaii	2,014,875	1,343,250	757,224	4,115,349	----------	4,115,349
Puerto Rico	2,134,036	2,227,516	1,935,614	6,297,166	----------	6,297,166

Table 9.—Federal highway funds paid by Bureau of Public Roads during fiscal year ended June 30, 1959, by program and by State

State or territory	Primary [1]	Secondary	Urban	Subtotal	Interstate	"D" fund	"L" fund	Total
Alabama	$8,912,834	$5,752,648	$2,303,489	$16,968,971	$18,407,187	$4,729,199	$1,477,955	$41,583,312
Alaska	6,881,589	3,651,378	17,703	10,550,670		2,337,666	286,254	13,174,590
Arizona	7,312,064	3,132,867	785,068	11,229,999	17,915,229	4,207,147	597,399	33,949,774
Arkansas	2,946,245	3,236,997	2,122,156	8,305,398	15,730,238	4,883,309	1,479,044	30,397,989
California	12,013,933	9,031,447	12,880,475	33,925,855	133,557,848	15,256,079	3,508,871	186,248,653
Colorado	8,251,203	4,593,507	1,659,721	14,504,431	18,799,974	3,227,437	810,573	37,342,415
Connecticut	2,168,199	1,257,442	6,274,170	9,699,811	10,822,334	1,637,714	531,328	22,691,187
Delaware	1,459,384	1,477,171	379,695	3,316,250	3,020,791	1,143,000	366,000	7,846,041
Florida	5,699,700	3,730,972	1,891,032	11,321,704	35,891,172	5,048,009	1,658,554	53,919,439
Georgia	10,145,204	7,190,306	2,024,085	19,359,595	20,696,245	4,013,429	15,852	44,085,121
Idaho	5,315,614	3,387,004	293,297	8,995,915	10,733,978	2,698,895	603,357	23,032,145
Illinois	16,235,127	8,617,183	7,970,753	32,823,063	61,617,169	7,739,255	2,138,979	104,318,466
Indiana	13,958,963	6,769,960	2,259,462	22,988,385	16,058,543	3,369,755	922,430	43,339,113
Iowa	8,029,147	8,555,424	2,459,790	19,044,361	31,611,632	6,274,067	1,966,454	58,896,514
Kansas	8,015,407	6,156,247	2,302,291	16,473,945	31,541,844	6,141,400	1,889,768	56,046,957
Kentucky	7,785,267	5,993,875	3,119,029	16,898,171	26,305,710	3,611,855	1,137,119	47,952,855
Louisiana	7,860,010	5,740,716	5,575,489	19,176,215	36,346,322	3,362,190	992,080	59,876,807
Maine	2,140,400	2,777,758	769,632	5,687,790	12,599,113	1,111,240	357,611	19,755,754
Maryland	4,744,769	2,952,163	4,159,243	11,856,175	23,249,834	2,033,870	660,833	37,800,712
Massachusetts	4,629,658	2,358,161	9,338,603	16,326,422	30,904,808	2,558,750		49,789,980
Michigan	12,356,573	5,767,939	5,599,908	23,724,420	45,277,622	6,783,766	51,036	75,836,844
Minnesota	12,852,146	7,647,557	3,980,933	24,480,636	29,056,027	6,166,621	227,608	59,930,892
Mississippi	7,839,430	6,495,736	1,239,008	15,574,174	21,138,798	3,546,704		40,259,676
Missouri	8,552,639	5,435,189	4,640,097	18,627,925	52,705,231	7,085,262	2,317,969	80,736,387
Montana	8,575,226	6,679,103	671,190	15,925,519	9,505,575	2,905,728	762,569	29,099,391
Nebraska	8,054,317	5,675,383	664,770	14,394,470	6,653,384	2,742,147	910,189	24,700,190
Nevada	2,595,291	3,366,548	115,540	6,077,379	7,289,864	2,816,537	228,289	16,412,069
New Hampshire	1,859,010	1,261,398	1,083,879	4,204,287	9,926,731	701,688		14,832,706
New Jersey	5,496,537	1,198,966	5,025,642	11,721,145	22,303,947	1,682,267	190,538	35,897,897
New Mexico	6,280,334	3,528,044	863,422	10,671,800	21,237,653	4,078,467	872,289	36,860,209
New York	17,592,590	4,151,898	36,264,820	58,009,308	98,088,452	9,282,028	3,061,356	168,441,144
North Carolina	9,660,011	5,993,928	3,339,168	18,993,107	25,264,315	5,852,816	1,883,674	51,993,912
North Dakota	5,112,520	4,017,769	481,405	9,611,694	14,806,891	1,981,564	868,175	27,268,324
Ohio	21,596,479	7,387,902	8,241,879	37,226,260	145,963,722	6,478,203	2,000,060	191,668,245
Oklahoma	7,410,603	7,046,686	1,781,565	16,238,854	37,786,534	6,286,589	1,920,506	62,232,483
Oregon	5,622,573	3,518,763	2,062,233	11,203,569	23,903,297	2,785,994	572,623	38,465,483

Pennsylvania	16,469,132	8,893,207	19,709,417	45,071,756	75,021,178	5,084,008	1,617,436	126,794,378
Rhode Island	1,452,838	1,201,638	926,284	3,580,760	6,735,958	891,206	271,782	11,479,706
South Carolina	4,497,364	3,737,956	2,219,404	10,454,724	19,432,497	2,845,400		32,732,621
South Dakota	3,576,923	3,638,409	338,851	7,554,183	6,623,393	2,349,466	524,134	17,051,176
Tennessee	10,044,597	6,746,599	4,917,665	21,708,861	19,575,557	6,289,652	506,697	48,080,767
Texas	20,117,210	14,525,190	9,794,100	44,436,500	81,355,200	15,083,400	4,666,900	145,542,000
Utah	4,167,217	3,248,119	1,490,048	8,905,384	14,157,871	2,490,029		25,553,284
Vermont	2,088,659	1,127,592	95,603	3,311,854	4,287,499	993,788	300,379	8,893,520
Virginia	7,165,554	5,122,709	4,027,421	16,315,684	25,527,793	4,524,636	1,425,401	47,793,514
Washington	6,302,509	5,201,415	3,587,004	15,090,928	42,590,637	3,490,726	781,561	61,953,852
West Virginia	6,253,002	4,979,497	1,744,275	12,976,774	11,171,499	2,495,650	831,885	27,475,808
Wisconsin	9,029,965	6,504,272	5,135,904	20,670,141	23,652,249	3,244,932	1,047,848	48,615,170
Wyoming	3,430,946	3,095,643	160,978	6,687,567	18,904,915	1,866,358	374,058	27,832,898
District of Columbia	1,699,832	841,859	965,082	3,506,773	5,423,341	1,291,958	432,997	10,655,069
Hawaii	1,008,240	1,019,749	513,421	2,541,410		1,293,100	407,040	4,241,550
Puerto Rico	1,607,072	28,483	1,949,833	3,585,388		910,234	180,329	4,675,951
Total	384,872,056	245,448,372	202,215,932	832,536,360	1,481,177,601	211,705,190	50,635,789	2,576,054,940

[1] Funds available for either urban or rural portions of the Federal-aid primary highway system.

Table 10.—Balances of Federal-aid funds available to States for projects not yet programed as of June 30, 1959

State or territory	Primary [1]	Secondary	Urban	Subtotal	Interstate	Total
Alabama	$171,888	$901,800	$2,094,643	$3,168,331	$20,904,605	$24,072,936
Alaska	2,256,361	579,146	168,953	3,004,460		3,004,460
Arizona	200,378	146,569	106,637	453,584	21,243,576	21,697,160
Arkansas	7,622,595	5,378,462	1,137,080	14,138,137	357,914	14,496,051
California	19,218	1,136,569	956,000	2,111,787	72,954,062	75,065,849
Colorado	1,659,143	3,610,973	1,750,541	7,020,657	18,745,818	25,766,475
Connecticut	422,914	1,130,068	8,370,170	9,923,152	15,471,018	25,394,170
Delaware	1,714,577	938,133	1,111,842	3,764,552	14,890,547	18,655,099
Florida	650,878	462,656	1,238,405	2,351,939	3,696,223	6,048,162
Georgia	345,422	682,172	1,494,131	2,521,725	4,829,594	7,351,319
Idaho	2,234,506	3,510,339	132,982	5,877,827	29,088,216	34,966,043
Illinois	653,157	631,801	1,643,407	2,928,365	26,009,680	28,938,045
Indiana	2,308,574	235,163	10,507,344	13,051,081	48,876,092	61,927,173
Iowa	274,160	370,424	131,259	775,843	956,220	1,732,063
Kansas	1,509,200	1,791,630	358,662	3,659,492	22,921,197	26,580,689
Kentucky	168,971	134,175	583,440	886,586	10,069,553	10,956,139
Louisiana	218,664	94,093	551,763	864,520	23,532,890	24,397,410
Maine	3,764,841	1,601,872	2,242,051	7,608,764	12,210,222	19,818,986
Maryland	1,674,298	782,726	2,829,947	5,286,971	29,099,783	34,386,754
Massachusetts	2,160,997	973,242	8,604,756	11,738,995	9,553,086	21,292,081
Michigan	5,912,474	4,216,587	7,347,432	17,476,493	13,484,521	30,961,014
Minnesota	26,489	3,085,174	716,621	3,828,284	45,592,349	49,420,633
Mississippi	1,039,261	878,614	607,242	2,525,117	3,978,944	6,504,061
Missouri	3,265,658	539,863	3,026,980	6,832,501	33,263,320	40,095,821
Montana	2,449,700	3,328,639	809,491	6,587,830	52,905,393	59,493,223
Nebraska	2,250,815	1,582,375	2,861,825	6,695,015	45,389,754	52,084,769
Nevada	6,259,227	1,966,694	491,408	8,717,329	23,796,064	32,513,393
New Hampshire	1,569,289	482,079	933,025	2,984,393	3,749,947	6,734,340
New Jersey	2,959,396	1,073,838	11,637,021	15,670,255	72,516,398	88,186,653
New Mexico	1,130,075	1,403,715	110,767	2,644,557	7,064,818	9,709,375
New York	7,942,151	5,787,219	16,926,487	30,655,857	34,918,736	65,574,593
North Carolina	8,153,898	6,991,916	1,618,510	16,764,324	30,653,245	47,417,569
North Dakota	151,019	316,715	524,127	991,861	12,242,768	13,234,629
Ohio	480,609	6,115,516	3,415,881	10,012,006	1,622,279	11,634,285
Oklahoma	2,243,129	225,519	1,843,914	4,312,562	13,051,294	17,363,856
Oregon	391,125	150,936	436,216	978,277	7,830,564	8,808,841

Pennsylvania	9,035,659	9,196,897	21,981,938	40,214,494	96,831,795	137,046,289
Rhode Island	1,307,843	265,249	821,268	2,394,360	8,512,556	10,906,916
South Carolina	3,780,951	2,428,510	469,211	6,678,672	48,683	6,727,355
South Dakota	199,020	681,121	112,144	992,285	2,561,317	3,553,602
Tennessee	1,685,166	3,897,348	3,410,897	8,993,411	5,661,259	14,654,670
Texas	709,137	15,024,690	2,846,284	18,580,111	13,111,473	31,691,584
Utah	596,874	509,961	28,414	1,135,249	6,938,753	8,074,002
Vermont	512,239	197,080	688,387	1,397,706	12,367,102	13,764,808
Virginia	3,724,947	2,251,225	2,871,418	8,847,590	81,518,188	90,365,778
Washington	2,798,020	1,566,985	2,363,146	6,728,151	7,314,018	14,042,169
West Virginia	1,610,017	1,865,400	866,274	4,341,691	2,668,550	7,010,241
Wisconsin	28,898	3,175,816	160,417	3,365,131	34,622,828	37,987,959
Wyoming	605,629	382,683	80,101	1,068,413	13,846,193	14,914,606
District of Columbia	1,907,779	2,463,321	4,122,021	8,493,121	15,293,519	23,786,640
Hawaii	946,773	1,091,448	861,537	2,899,758	----------	2,899,758
Puerto Rico	729,781	1,089,548	819,431	2,638,760	----------	2,638,760
Total	106,433,790	109,324,694	141,823,848	357,582,332	1,088,766,924	1,446,349,256

[1] Funds available for either urban or rural portions of the Federal-aid primary system.

Table 11.—Interstate System improvements financed with Federal-aid funds:[1] Status of projects as of June 30, 1959, and projects completed during the fiscal year

State or territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$57,393,711	$38,436,920	125.8	$13,122,673	$11,918,226	46.2	$78,419,570	$69,151,428	158.4	$10,461,410	$9,190,512	26.8
Arizona	11,050,000	10,597,817	43.0	8,968,743	8,464,687	32.9	36,543,626	34,376,620	93.1	14,778,380	13,844,186	85.6
Arkansas	37,710,158	33,939,143	34.4	7,861,880	7,076,672	26.3	60,007,233	52,765,271	59.1	6,455,197	4,807,151	20.8
California	38,182,103	34,768,373	16.5	25,654,501	13,191,267	29.0	306,286,532	206,520,142	114.2	331,622,133	189,557,771	113.5
Colorado	3,705,940	3,387,272	8.7	2,086,721	1,856,342	15.1	25,480,668	23,127,898	80.2	37,509,542	32,896,908	110.8
Connecticut	3,900,000	3,510,000	1.1	25,650,138	22,811,093	12.3	23,025,058	20,506,794	10.8	20,628,730	17,120,050	14.2
Delaware	8,229,957	7,409,437	2.7	3,175,074	2,855,091	.1	17,903,200	15,042,718	.8	1,127,098	995,469	1.0
Florida	15,839,184	14,255,266	32.2	18,543,749	16,688,738	24.1	92,987,309	83,513,577	80.9	36,616,202	31,218,553	11.0
Georgia	74,783,574	67,305,201	131.7	9,936,205	8,946,137	22.1	109,918,534	88,827,329	97.6	12,190,575	8,352,252	8.9
Idaho	5,409,489	5,047,433	2.2	4,723,181	4,359,023	22.5	27,765,115	25,475,235	85.6	5,855,497	4,748,030	14.5
Illinois	48,029,742	40,487,401	29.6	31,745,959	26,798,905	26.5	254,202,415	221,680,789	85.5	54,168,702	41,759,880	24.8
Indiana	40,725,924	36,653,332	36.3	36,653,870	31,969,068	47.3	84,173,282	72,497,476	79.4	5,554,976	4,824,419	.3
Iowa	15,396,480	13,977,554	40.5	16,427,695	14,882,925	43.2	62,995,132	56,396,121	132.8	39,402,114	33,385,453	156.0
Kansas	13,687,559	12,318,804	19.8	2,285,740	2,057,165	5.2	35,393,408	31,827,093	70.0	37,640,821	33,746,219	160.0
Kentucky	25,953,036	23,357,733	27.4	7,915,294	7,123,764	8.5	101,506,778	90,402,906	97.8	9,050,454	7,288,182	13.0
Louisiana	12,179,491	10,963,542	10.8	14,612,000	13,150,800	25.2	110,914,788	97,228,951	56.5	5,184,259	4,441,598	6.6
Maine	2,985,100	2,686,590	1.5	4,836,845	4,292,202	11.0	30,236,970	26,989,007	27.2	4,764,350	4,285,094	7.7
Maryland	28,196,300	25,405,530	17.6	1,477,360	1,404,044	----------	40,536,107	34,485,536	15.2	29,373,443	23,713,100	23.2
Massachusetts	28,204,067	25,384,561	13.1	39,156,030	34,815,673	19.2	110,136,200	95,660,989	35.0	9,922,498	7,581,151	6.8
Michigan	38,094,340	34,284,906	40.6	31,642,931	28,407,013	49.9	146,957,604	132,247,444	92.4	48,929,629	42,603,987	45.4
Minnesota	3,368,856	3,031,970	6.7	7,673,346	6,817,420	5.3	109,742,290	97,623,810	40.7	6,687,839	5,453,969	19.9
Mississippi	36,825,391	33,192,360	127.2	5,624,700	5,093,490	17.9	68,305,080	59,496,448	148.4	8,488,121	7,151,932	23.9
Missouri	9,937,617	8,943,856	16.4	11,094,932	10,013,398	24.3	91,505,452	80,301,049	99.5	41,399,314	33,774,411	24.1
Montana	7,441,900	6,763,465	34.2	5,937,594	5,513,148	9.1	34,760,769	31,804,103	82.4	6,114,606	5,492,293	20.3

Nebraska	674,040	606,635		8,161,045	7,260,549	11.6	33,361,435	29,618,052	12.3	7,623,175	6,263,258	10.7
Nevada	235,415	223,644		44,543	42,315		35,900,870	34,134,848	30.2	7,835,972	7,287,309	20.4
New Hampshire	3,108,020	2,797,218	4.3	6,690,078	5,754,515	9.5	28,946,807	25,604,856	31.8	10,244,902	7,382,460	8.8
New Jersey	12,655,157	11,387,280	8.3	21,676,149	19,132,317	9.1	86,114,882	73,736,730	17.8	18,869,312	16,732,342	9.7
New Mexico	10,512,304	9,729,747	21.9	1,078,277	1,000,769	2.5	30,651,389	28,467,726	83.2	28,677,533	26,595,577	144.1
New York	22,147,870	19,933,082	9.6	36,766,541	28,231,735	7.9	461,672,596	378,328,386	120.3	51,372,594	33,359,252	7.7
North Carolina	23,490,763	21,143,811	93.7	9,317,840	8,385,540	43.1	45,807,248	41,109,224	186.1	34,855,030	29,548,298	221.1
North Dakota	4,135,499	3,771,949	28.8	7,458,550	6,737,243	39.3	24,513,570	21,956,444	120.2	19,098,950	17,365,091	117.9
Ohio	129,000	116,100					284,109,948	251,625,078	216.5	99,992,008	84,549,695	62.7
Oklahoma	12,607,260	11,163,184	52.1	16,115,520	14,495,364	54.4	45,842,211	41,220,617	98.0	29,102,880	24,975,087	98.1
Oregon	12,561,680	11,332,460	34.5	8,266,361	7,631,800	32.5	64,790,961	59,709,129	163.1	15,407,137	13,872,653	87.1
Pennsylvania	28,473,009	25,463,708	20.8	4,342,800	3,908,520	4.0	203,965,653	182,297,502	147.2	57,797,938	47,180,822	49.5
Rhode Island	5,575,000	5,017,500	.5				17,487,904	15,373,924	2.5	12,562,624	10,399,048	8.9
South Carolina	14,854,853	10,790,457	14.7	9,014,825	8,137,743	38.4	65,725,726	58,453,584	225.5	9,306,474	7,792,963	9.8
South Dakota	37,097,072	33,810,820	78.3				30,527,917	27,823,205	65.0	4,396,468	3,606,099	7.2
Tennessee	55,598,503	50,038,655	51.1	17,738,313	15,964,479	24.2	120,669,902	105,018,026	88.6	5,442,832	4,374,607	9.5
Texas	85,241,300	76,560,070	154.0	25,287,375	22,729,650	28.0	202,891,939	182,204,746	289.2	78,508,105	70,117,884	254.7
Utah	13,505,820	12,814,426	40.8	9,134,212	8,641,337	23.8	31,320,546	29,311,517	47.4	14,012,850	13,132,179	14.1
Vermont	11,343,000	10,208,700	11.1				33,862,199	30,382,455	17.9	4,105,991	2,801,176	5.3
Virginia	29,960,587	27,035,028	23.6	7,002,733	6,338,770	12.1	89,122,754	79,599,852	101.8	15,446,104	12,396,901	19.6
Washington	17,061,450	15,474,280	12.5	2,350,571	2,020,210	1.1	77,006,787	68,242,410	76.7	25,060,560	21,131,324	81.9
West Virginia	32,828,351	29,545,516	26.7	8,684,750	7,684,275	3.1	63,016,767	53,178,460	45.7	2,856,706	2,412,799	
Wisconsin	23,223,089	20,951,780	88.7	16,542,205	14,702,514	40.3	61,113,298	51,786,501	139.7	21,570,676	18,803,007	82.2
Wyoming	7,395,400	6,868,608	47.7	1,013,100	940,966	3.7	50,396,806	46,809,817	181.8	8,884,881	8,117,231	46.0
District of Columbia	16,573,380	15,415,150	.8	4,500,700	4,050,630	1.9	24,697,691	22,023,739	1.2	1,704,600	1,534,140	.2
Total	1,048,217,741	928,308,274	1,644.5	557,993,649	484,297,532	913.7	4,273,220,926	3,685,965,562	4,353.2	1,368,662,192	1,059,963,772	2,316.3

[1] Includes projects financed from Federal-aid primary, secondary, urban, and Interstate funds.

[2] Initial commitment of funds.

Table 12.—Improvements of the Federal-aid primary system in rural areas financed with Federal-Aid funds: [1] Status of projects as of June 30, 1959, and projects completed during the fiscal year

State or territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$27,466,160	$22,561,219	95.5	$21,407,926	$15,550,012	189.9	$88,156,470	$69,801,947	403.3	$29,384,115	$18,718,605	293.4
Alaska	8,436,365	8,387,537	80.7	1,877,000	1,877,000	25.6	11,576,976	8,708,859	77.8	4,173,209	4,152,392	61.0
Arizona	8,909,988	8,554,972	38.6	7,170,116	6,543,859	42.6	32,899,123	30,305,121	122.8	24,875,733	21,761,683	156.4
Arkansas	14,637,822	10,669,975	76.8	6,964,300	6,133,438	31.0	43,793,700	32,278,359	221.9	12,455,387	7,795,082	156.6
California	21,041,660	12,399,794	32.8	24,841,118	17,033,951	51.3	184,145,885	121,679,378	191.9	115,736,568	66,447,499	199.5
Colorado	11,820,946	7,922,347	69.5	4,453,807	3,161,240	41.5	35,643,097	28,125,948	223.4	38,880,514	28,172,447	255.0
Connecticut	250,000	165,000		21,128,251	16,245,669	15.3	33,801,178	22,102,063	33.6	8,902,820	7,314,493	6.9
Delaware	5,192,233	4,462,585	7.9	4,785,834	3,658,771	7.7	13,940,000	9,518,118	40.2	2,673,130	1,746,947	11.5
Florida	15,989,008	13,440,178	41.0	15,907,092	13,122,838	42.5	57,626,328	45,695,895	163.2	20,909,545	14,008,259	144.2
Georgia	71,957,917	59,920,258	252.4	11,698,532	9,784,742	35.4	109,629,798	76,216,819	586.3	18,049,689	9,527,128	155.8
Idaho	8,460,463	7,226,775	17.0	5,217,064	4,851,669	22.6	33,870,947	27,825,084	216.3	9,504,029	6,932,110	96.6
Illinois	33,399,071	27,339,289	42.0	33,274,683	25,130,474	80.9	147,784,193	109,232,113	576.1	47,614,881	25,535,178	356.1
Indiana	43,886,669	33,917,172	94.3	37,476,166	31,550,294	86.2	118,057,361	88,492,588	327.4	28,095,626	16,347,002	333.6
Iowa	12,601,325	11,286,446	48.7	13,100,396	11,264,484	53.9	61,418,433	47,744,107	383.8	60,744,621	44,680,675	614.7
Kansas	7,506,585	5,934,777	29.6	6,768,435	3,882,004	127.9	38,268,062	27,007,404	401.5	50,457,536	35,943,830	564.7
Kentucky	30,564,578	25,159,504	51.6	7,664,987	6,686,354	9.1	101,532,780	79,124,892	207.2	11,928,866	7,348,220	49.6
Louisiana	14,529,305	10,865,649	38.6	13,663,490	7,015,910	56.2	85,375,223	66,481,820	284.9	18,856,892	9,861,537	190.7
Maine	4,987,200	3,240,480	7.0	3,713,995	3,198,277	8.0	25,634,855	19,932,233	88.5	7,771,484	5,754,305	47.6
Maryland	27,130,400	23,339,380	29.8	2,445,563	1,414,771	14.3	34,371,012	24,280,404	73.9	17,266,423	13,594,256	40.1
Massachusetts	5,711,793	5,139,520	3.2	24,896,711	20,220,295	15.0	55,307,372	40,981,449	61.4	13,213,890	8,468,717	19.0
Michigan	42,092,954	36,289,813	72.2	34,780,512	28,785,959	110.5	129,863,391	107,585,372	299.5	59,995,989	40,562,652	384.6
Minnesota	1,882,627	1,675,276	6.6	5,729,694	3,817,891	70.3	51,408,217	34,625,142	283.2	20,116,829	11,613,536	341.5
Mississippi	35,212,645	29,828,917	183.3	13,397,154	8,024,488	96.8	63,744,075	48,847,222	406.1	17,021,706	11,279,388	206.4
Missouri	6,591,121	4,269,024	24.6	16,050,524	10,874,278	73.8	78,074,418	59,363,627	259.8	32,805,278	20,698,317	182.9
Montana	10,125,450	8,372,419	89.9	6,574,488	5,127,356	67.3	52,601,097	42,139,192	320.9	14,143,544	10,035,781	148.5
Nebraska	2,872,524	1,781,877	23.6	12,495,123	9,434,928	67.4	34,730,610	25,230,754	285.3	27,890,803	16,630,528	358.5
Nevada	326,669	299,567		2,105,330	1,756,888	31.7	15,333,525	14,219,131	86.7	13,069,675	11,787,825	93.5
New Hampshire	3,168,466	2,827,441	4.3	7,679,974	6,253,566	12.0	32,314,678	26,248,501	57.5	8,577,955	4,814,317	30.8

New Jersey	14,948,151	11,330,649	15.6	12,231,969	7,991,352	9.3	59,231,611	45,536,536	58.0	22,790,514	15,839,670	15.0
New Mexico	4,915,804	4,502,964	17.3	1,078,277	1,000,769	2.5	28,046,857	23,726,540	153.9	39,823,981	33,680,268	245.5
New York	20,435,891	14,847,892	38.2	24,940,911	13,468,081	90.3	162,036,577	115,146,665	324.3	47,366,481	23,852,121	194.7
North Carolina	27,033,057	20,683,934	132.7	13,001,358	10,149,577	76.9	62,044,119	47,979,267	419.4	64,827,433	43,821,462	708.8
North Dakota	4,701,289	4,101,444	31.9	10,760,680	8,294,031	89.6	37,140,998	28,734,546	503.8	29,331,471	21,987,671	522.1
Ohio	199,030	181,372		8,597,055	4,484,628	25.7	260,787,675	212,810,019	414.3	119,141,103	82,135,009	463.7
Oklahoma	19,997,960	14,850,084	103.3	22,596,029	16,862,984	130.2	46,894,770	37,288,749	170.7	39,048,612	28,190,838	259.4
Oregon	10,028,327	8,934,903	35.2	10,286,814	8,628,676	51.1	53,716,849	45,464,814	248.5	21,558,669	17,299,699	146.8
Pennsylvania	25,799,751	16,695,879	33.9	13,891,900	8,273,550	14.4	164,373,310	126,905,468	299.7	62,431,246	41,546,363	140.1
Rhode Island	780,000	390,000		3,903,176	1,951,588	5.6	5,331,980	4,298,442	7.6	2,903,867	2,368,557	21.3
South Carolina	19,516,518	12,210,040	87.7	11,589,860	9,425,261	72.5	74,755,475	61,945,755	413.7	22,731,505	14,942,392	142.2
South Dakota	38,123,921	33,162,134	163.5	6,229,901	3,456,960	167.1	33,256,102	27,263,565	349.4	12,702,202	8,321,829	485.4
Tennessee	41,481,588	35,714,486	60.7	10,593,892	9,183,225	29.4	84,268,704	64,907,268	270.7	23,351,057	13,560,502	208.3
Texas	50,728,700	45,007,830	115.7	13,201,110	8,448,450	75.8	190,150,175	143,376,605	1,228.3	95,875,873	66,817,349	1,188.0
Utah	11,405,820	10,688,856	40.9	10,206,011	8,480,479	55.3	28,187,810	25,811,799	87.6	13,489,180	10,988,450	86.5
Vermont	11,343,000	10,208,700	11.1	2,323,512	1,161,756	9.4	34,441,022	27,582,133	52.1	7,507,062	4,395,271	27.0
Virginia	21,938,729	19,182,609	36.2	9,747,526	7,808,899	82.6	98,724,628	82,023,656	168.0	28,813,891	17,787,904	258.9
Washington	8,674,900	5,635,900	59.6	2,790,584	2,206,940	15.3	44,322,286	34,254,625	178.1	26,633,249	19,407,097	261.8
West Virginia	25,894,939	21,375,684	27.9	10,227,225	8,627,133	3.6	60,119,133	48,297,943	56.8	10,468,872	5,962,878	42.9
Wisconsin	19,482,420	16,174,186	117.4	15,033,204	11,192,710	116.9	56,021,347	42,103,048	364.5	39,678,063	27,409,742	418.5
Wyoming	11,093,400	9,252,994	89.3	3,005,063	2,223,349	34.6	58,043,040	50,911,374	297.3	13,508,327	10,668,078	133.9
Hawaii	628,000	314,000	1.8	79,075	38,670	.2	3,562,014	1,985,007	7.6	1,872,020	947,557	10.9
Puerto Rico	8,287,020	4,130,860	18.0				6,224,878	3,275,602	13.7	1,275,406	605,265	4.1
Total	874,190,159	706,854,591	2,699.4	583,583,397	435,760,474	2,645.0	3,422,584,164	2,635,512,968	12,772.4	1,482,246,821	994,068,681	11,485.5

[1] Includes projects on rural portions of the Federal-aid primary highway system financed from Federal-aid primary, secondary, "D", and Interstate funds.
[2] Initial commitment of funds.

Table 13.—Improvements on secondary roads in rural areas financed with Federal-aid funds: [1] Status of projects as of June 30, 1959, and projects completed during the fiscal year

State or territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$3,242,377	$1,636,199	183.4				$17,316,808	$8,934,066	689.6	$13,528,013	$6,898,567	662.4
Alaska	6,812,952	6,806,911	65.6	$1,553,750	$1,191,000	50.1	8,554,503	7,249,408	86.7	4,105,953	3,439,025	218.4
Arizona	3,180,000	2,377,770	48.7				7,740,087	5,908,780	146.0	4,018,912	2,959,381	68.6
Arkansas	6,507,152	3,256,696	276.8				10,590,510	5,731,425	369.2	9,336,870	5,050,188	427.5
California	23,534,133	13,745,707	227.3				13,539,536	7,012,196	123.0	24,874,202	13,590,643	341.2
Colorado	3,358,416	1,899,856	60.1				8,056,669	4,003,150	136.7	10,658,628	5,569,448	175.7
Connecticut	1,420,000	770,000	4.9				6,962,905	3,657,385	22.4	2,110,112	956,625	5.0
Delaware	220,388	110,194	1.4				4,560,200	2,632,885	35.1	2,973,736	1,469,849	34.1
Florida	8,783,258	4,394,829	174.1				11,722,231	6,109,781	244.8	9,264,949	4,454,712	381.8
Georgia	14,991,946	7,638,423	335.8				30,647,303	15,973,565	637.9	13,207,210	6,609,877	375.9
Idaho	2,246,866	1,416,814	96.5				8,526,430	5,748,073	227.6	7,221,070	4,456,322	167.8
Illinois	20,936,372	10,468,186	389.3				34,460,151	18,072,737	694.5	20,291,765	10,087,019	634.6
Indiana	9,969,908	5,027,104	50.5	10,558,224	5,259,862	117.0	19,046,140	9,615,575	165.3	16,805,391	8,657,236	190.5
Iowa	2,504,358	1,339,459	116.4				17,059,572	8,973,549	668.9	24,262,683	12,461,211	1,132.0
Kansas	8,321,710	4,160,255	565.0				19,143,487	10,095,438	1,148.7	13,888,585	7,266,401	1,164.7
Kentucky	4,417,164	2,380,382	31.7				26,409,786	13,965,317	266.6	10,372,335	5,318,906	129.6
Louisiana	2,469,690	1,262,045	19.2				35,946,902	18,290,288	561.2	11,866,679	6,023,810	261.6
Maine							6,184,459	3,167,364	54.5	4,848,408	2,445,291	40.0
Maryland	2,787,800	1,405,900	22.0				9,019,870	4,493,039	164.1	6,361,983	3,120,857	130.3
Massachusetts	2,638,752	1,349,376	8.6				5,512,319	3,057,129	11.5	1,459,124	713,587	7.7
Michigan	14,112,151	7,148,475	472.1				15,851,655	8,651,825	397.4	14,682,781	7,448,572	584.8
Minnesota	375,607	327,604	6.5				22,646,397	11,837,455	1,324.1	17,768,978	9,105,569	1,489.4
Mississippi	9,431,387	4,319,453	361.4				24,311,681	12,627,043	792.1	17,346,366	8,518,515	618.6
Missouri	18,552,702	9,307,431	1,111.4				17,687,761	8,387,954	873.2	18,162,550	9,875,815	1,077.7

Montana	4,614,200	2,874,509	73.8				15,550,231	10,496,225	445.7	10,838,157	6,562,560	266.4
Nebraska	4,550,068	2,301,182	128.5				26,709,609	14,130,217	881.1	12,960,005	6,525,137	560.2
Nevada	907,438	755,479	14.7				2,762,375	2,095,104	76.7	7,993,620	6,518,379	192.3
New Hampshire	1,455,496	724,648	5.7				4,749,274	2,723,016	17.1	3,999,649	2,069,470	25.8
New Jersey	3,020,000	1,510,000	34.9				3,166,432	1,637,856	18.3	569,404	281,087	3.6
New Mexico	2,386,014	1,495,199	38.7				9,496,011	6,323,452	173.9	7,915,281	5,119,723	190.0
New York	5,109,890	2,554,945	44.9				41,316,056	20,293,596	237.0	7,381,929	3,443,163	36.8
North Carolina	9,941,320	5,019,160	347.2				13,402,999	7,017,619	261.2	12,270,804	6,041,366	316.6
North Dakota	6,383,472	3,231,136	865.3				10,892,847	6,189,748	819.8	12,115,836	6,070,290	1,318.4
Ohio	13,829,536	7,595,080	60.6				38,046,000	21,123,632	273.3	17,547,517	9,044,137	189.4
Oklahoma	10,090,582	5,073,757	405.3				17,292,855	8,800,045	437.5	17,265,068	9,081,954	540.3
Oregon	5,844,111	3,493,001	73.6				10,061,621	6,353,564	190.5	8,067,213	4,871,007	212.7
Pennsylvania	2,898,222	1,449,111	14.9				34,803,769	17,426,129	213.7	11,050,013	5,480,178	73.5
Rhode Island							1,083,099	542,371	6.8	81,346	40,673	
South Carolina	6,547,553	3,405,802	379.8				17,272,290	9,041,374	1,033.7	7,177,076	3,602,697	444.6
South Dakota	7,371,913	4,216,612	404.0				7,069,925	4,136,315	463.9	9,894,061	5,719,275	707.3
Tennessee	15,046,000	7,529,800	417.3				16,179,751	8,515,768	598.3	18,400,971	8,892,556	622.7
Texas	10,446,500	5,375,850	270.8				31,331,756	15,961,000	850.4	39,026,079	20,109,830	1,403.1
Utah	2,455,000	1,826,763	47.0				5,512,960	4,076,654	119.4	4,101,047	3,018,396	124.0
Vermont	1,179,500	589,750	19.3				4,070,063	2,079,134	45.6	2,170,037	1,209,589	24.9
Virginia	5,379,616	2,909,669	187.7				14,010,874	7,861,874	190.4	15,196,605	8,131,148	360.0
Washington	4,585,893	2,247,234	135.8				11,561,597	6,693,376	201.1	11,634,034	5,944,803	359.8
West Virginia	10,461,640	5,243,540	114.1	7,199,569	3,691,908	172.7	10,751,201	5,835,846	56.5	9,558,537	5,186,636	122.2
Wisconsin	8,733,132	4,479,766	301.8				15,721,815	8,289,511	420.4	15,253,459	8,066,959	492.7
Wyoming	2,747,000	1,777,892	81.1				6,413,344	4,129,386	117.1	4,577,406	2,953,579	98.3
Hawaii	972,000	486,000	2.5	317,318	133,288	.7	3,092,518	1,535,604	5.8	1,351,533	675,174	2.5
Puerto Rico	3,205,100	1,305,600	13.9				10,810,347	5,059,777	56.4	5,889,582	2,756,306	28.5
Total	320,976,285	172,020,554	9,111.9	19,628,861	10,276,058	340.5	764,628,981	412,563,620	18,052.7	553,703,552	293,913,498	19,036.5

[1] Includes projects on secondary roads in rural areas financed from Federal-aid secondary and "D" funds.

[2] Initial commitment of funds.

Table 14.—Improvements in urban areas financed with Federal-aid funds: [1] Status of projects as of June 30, 1959, and projects completed during the fiscal year

State or territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$38,423,545	$20,240,055	65.2	$6,345,018	$3,904,359	41.5	$25,053,784	$17,917,073	23.0	$6,409,838	$4,240,861	57.5
Alaska	138,131	138,028		70,000	70,000	1.7	2,109,516	1,924,133	5.7	41,751	37,068	
Arizona	3,969,000	3,345,188	13.4	3,032,772	2,814,725	3.6	11,431,902	10,195,510	5.0	3,242,634	2,652,455	11.8
Arkansas	29,574,568	26,535,089	33.9	3,212,300	2,120,045	12.6	41,603,642	33,989,678	36.9	3,143,532	1,853,751	11.5
California	47,294,483	36,910,304	24.7	35,837,769	15,458,416	7.9	221,184,619	140,702,377	63.3	299,992,261	166,373,841	54.9
Colorado	1,462,985	883,195	4.8	877,177	519,717	.3	9,346,688	6,370,199	12.2	21,117,594	17,261,738	22.5
Connecticut	3,870,000	3,455,000	1.1	11,904,535	10,218,988	3.3	40,887,420	24,521,254	26.4	20,057,263	13,787,600	25.9
Delaware	3,590,724	3,223,362		98,640	75,720	.2	10,241,700	8,888,100	2.5	1,627,078	645,291	3.5
Florida	5,396,134	3,588,067	8.2	9,409,605	7,071,756	5.8	69,690,111	55,914,095	33.8	32,696,263	26,382,159	19.7
Georgia	25,984,468	19,214,518	18.4	874,356	500,574	5.4	79,031,427	54,169,236	76.2	9,601,563	6,670,107	13.2
Idaho	801,898	529,794	1.0	97,862	68,515	1.6	7,495,506	6,189,600	6.1	1,281,245	896,331	3.9
Illinois	37,426,610	24,983,498	32.7	28,187,610	20,489,642	16.8	220,970,109	173,736,020	78.6	56,153,506	43,245,138	27.5
Indiana	17,684,926	13,239,790	19.7	6,264,185	3,996,497	5.8	22,015,045	13,332,384	21.0	10,287,808	6,238,273	18.2
Iowa	6,680,946	5,123,264	7.8	5,956,089	5,297,747	13.8	25,171,924	21,840,678	31.4	7,034,393	4,729,211	24.9
Kansas	9,305,092	7,972,186	14.6	3,298,196	2,070,240	5.5	19,241,928	16,140,644	27.4	16,636,809	12,571,133	45.6
Kentucky	11,485,890	7,048,745	15.4	880,138	771,276	.4	40,839,397	33,560,159	20.9	10,037,046	6,833,012	8.5
Louisiana	5,666,352	4,122,776	6.2	11,482,981	9,986,490	12.3	64,258,562	50,000,906	30.4	22,500,235	11,882,287	20.3
Maine	1,124,500	1,012,050		1,331,250	1,198,125	3.7	16,787,374	13,666,776	11.6	2,001,173	1,177,627	4.8
Maryland	12,246,900	7,663,450	13.8	3,650,560	2,789,704	4.8	39,708,404	28,861,793	25.5	23,329,607	15,831,018	16.3
Massachusetts	22,867,330	20,432,569	10.3	39,138,708	27,015,485	18.4	117,698,474	87,507,159	45.5	18,600,473	9,898,197	9.3
Michigan	23,060,679	11,446,140	6.4	10,727,298	6,357,088	10.5	75,479,179	52,826,866	31.3	35,893,784	26,383,771	51.0
Minnesota	1,635,843	1,436,502	.1	7,178,590	5,715,496	4.9	109,418,251	90,441,705	75.4	14,295,425	8,977,581	58.0
Mississippi	8,881,191	6,941,645	20.1	2,758,746	2,021,766	3.6	29,212,485	23,033,060	49.1	3,316,406	2,079,582	8.9
Missouri	8,238,962	7,206,095	2.4	6,607,718	4,751,779	4.6	64,749,685	48,161,795	49.8	36,013,651	27,739,983	48.1
Montana	757,930	463,034	1.9	2,682,002	2,337,417	2.5	8,333,389	6,518,981	17.2	4,629,486	3,932,067	2.4
Nebraska	553,619	343,724	1.7	1,479,721	719,940	3.2	17,167,166	14,996,421	1.2	2,423,490	1,194,611	4.5
Nevada	3,092	2,572					25,550,632	24,198,176	.1	140,605	115,668	.3
New Hampshire	20,006	10,003		11,770	1,782		3,687,614	2,998,043	4.8	7,476,762	5,509,089	7.9
New Jersey	8,285,856	5,346,056	16.8	32,942,608	22,290,005	16.9	79,962,259	56,227,943	48.3	21,135,272	13,427,397	28.6
New Mexico	6,267,620	5,647,385	5.6				13,159,558	11,661,080	4.9	3,340,417	2,353,343	9.2
New York	20,138,486	13,755,943	18.1	56,506,813	36,791,981	18.1	539,237,200	380,541,064	163.6	115,141,554	61,952,727	71.8
North Carolina	8,777,022	6,861,255	29.3	806,032	510,038	3.5	12,726,751	8,523,791	25.6	7,147,878	5,041,491	40.5

North Dakota	439,628	235,814	2.7	399,520	359,568	1.2	1,145,376	743,911	2.3	2,947,599	2,329,676	29.0
Ohio	18,369,872	11,359,176	6.8	12,719,826	6,558,785	8.0	109,183,546	85,683,112	49.9	62,240,860	43,253,308	73.1
Oklahoma	4,984,100	2,662,362	12.7	4,782,223	3,284,752	10.3	13,666,493	11,368,111	14.7	16,306,572	10,788,446	35.5
Oregon	4,660,156	3,729,239	4.5	2,795,938	2,030,880	3.3	32,561,123	28,001,690	12.8	3,195,830	2,222,146	7.6
Pennsylvania	26,026,022	20,281,211	21.3	4,827,700	2,823,370	6.0	162,468,957	119,637,959	99.5	87,108,948	50,320,165	28.0
Rhode Island	8,266,000	6,363,000	10.2	214,870	122,900	2.2	28,577,471	19,544,206	29.2	15,311,015	11,027,750	26.3
South Carolina	3,518,107	2,857,054	8.8	4,681,630	2,371,143	4.9	12,291,486	8,178,762	23.1	4,942,793	2,505,729	21.0
South Dakota	6,046,265	4,583,725	12.0	363,278	201,581	1.8	9,900,919	7,821,264	12.1	1,390,363	899,518	2.6
Tennessee	22,367,311	18,449,367	13.7	9,514,593	7,969,152	6.0	81,673,245	62,393,367	36.3	16,219,520	8,560,929	20.1
Texas	37,859,700	33,515,890	52.0	29,418,277	23,441,430	28.5	121,585,865	95,437,304	191.5	61,845,753	46,243,672	118.8
Utah	2,800,000	2,646,450	4.9	5,991,379	5,555,594	9.9	9,241,353	8,198,956	3.8	10,417,651	9,394,908	13.5
Vermont							9,066,036	7,819,042	3.4	1,207,312	733,996	.6
Virginia	16,039,116	12,003,952	18.5	2,478,993	1,243,450	5.3	13,943,941	10,498,157	15.5	13,564,781	9,185,293	14.5
Washington	15,370,900	13,386,180	8.5	3,878,340	2,125,710	1.2	57,494,819	48,476,930	29.3	15,918,605	11,756,834	34.8
West Virginia	15,354,864	12,389,364	9.5	2,158,336	1,076,917	2.1	19,942,814	13,560,892	12.2	7,359,906	3,995,305	3.7
Wisconsin	10,675,539	7,778,726	5.5	9,038,100	7,270,378	10.7	43,339,202	29,819,906	14.9	8,924,163	5,666,527	13.4
Wyoming	200,000	128,720		608,613	391,822	3.1	5,430,543	4,766,899	5.8	2,790,465	2,301,182	5.8
District of Columbia	25,265,030	19,971,475	11.6	8,185,235	5,107,600	2.2	44,017,298	31,639,006	13.8	7,761,203	4,835,525	8.0
Hawaii	3,417,310	1,708,655	2.4	1,726	815		6,759,706	3,275,256	3.0	1,480,497	736,179	.7
Puerto Rico	6,580,000	3,290,000	1.7	1,526,330	756,130	.6	15,851,006	7,671,423	10.9	6,183,516	2,922,243	5.3
Total	599,854,708	446,461,642	600.9	397,235,956	270,627,290	340.5	2,861,592,900	2,124,092,852	1,638.7	1,163,864,154	741,593,739	1,193.3

[1] Includes projects in urban areas financed from Federal-aid primary, secondary, urban, "D", and Interstate funds.

[2] Initial commitment of funds.

Table 15.—Status of program authorized by secs. 2(a) and 2(e) ("D" and "L" funds, respectively) of the 1958 act: Programs approved, contracts awarded, and work completed during the fiscal year ended June 30, 1959, by State

State or territory	Programed [1] during fiscal year				Contracts awarded during fiscal year				Completed during fiscal year			
	Total cost	Federal funds		Miles	Total cost	Federal funds		Miles	Total cost	Federal funds		Miles
		"D" funds	"L" funds			"D" funds	"L" funds			"D" funds	"L" funds	
Alabama	$1,806,440	$1,088,439	$163,510	45.5	$9,109,589	$5,941,806	$1,783,311	192.1	$4,153,438	$2,752,652	$883,368	121.0
Alaska	3,299,500	2,752,574	352,736	42.2	7,440,174	5,874,267	381,824	131.4	472,674	435,418	28,156	4.5
Arizona	1,526,903	1,197,733	129,351	15.3	3,810,700	3,054,356	413,908	40.6	2,645,558	2,101,950	320,364	30.0
Arkansas	1,374,573	892,898	294,498	45.4	7,742,863	5,016,980	1,555,067	308.3	4,773,920	3,071,798	932,920	181.8
California	10,041,323	5,252,540	1,252,688	96.3	30,339,580	18,202,128	4,359,886	191.0	8,238,958	5,207,115	1,248,708	101.3
Colorado	6,506,495	4,254,558	1,073,461	152.0	9,352,625	6,259,199	1,576,074	193.7	4,082,987	2,829,068	695,389	86.3
Connecticut	2,213,288	1,144,298	290,372	18.8	6,277,162	3,733,466	1,153,428	36.4	1,177,599	759,584	219,872	10.5
Delaware					221,000	146,285	7,145	.9	216,000	144,000	48,000	2.7
Florida	463,067	285,825	25,976	.9	8,524,918	5,653,545	1,724,895	276.6	4,891,128	3,247,889	1,050,117	275.3
Georgia	1,594,146	1,045,133	270,335	25.5	13,705,194	9,119,163	2,817,302	290.8	265,266	176,844	58,948	6.8
Idaho	1,698,305	1,163,073	201,719	68.7	4,454,965	3,210,607	673,040	143.4	466,994	340,706	76,637	36.0
Illinois	18,813,782	12,060,635	3,320,085	389.8	24,979,640	16,048,220	4,251,432	522.8	5,960,315	3,902,406	1,010,069	173.5
Indiana	8,627,007	5,402,426	2,948,129	134.5	13,686,876	8,775,666	2,948,129	243.6	2,790,086	1,860,051	437,802	77.3
Iowa	6,122,302	3,585,193	987,296	246.3	13,570,953	8,523,047	2,633,135	401.6	8,652,385	5,547,090	1,768,156	225.0
Kansas	2,685,505	1,773,581	547,934	219.0	9,657,150	5,983,606	1,848,606	404.9	6,481,628	3,902,678	1,207,972	235.4
Kentucky	636,246	424,164	240,556	15.6	10,385,514	6,881,705	2,119,784	109.0	645,864	430,576	122,937	13.9
Louisiana	2,445,860	1,335,787	480,185	51.6	10,084,376	6,305,387	1,948,005	199.6	1,064,996	709,730	170,450	37.7
Maine	1,604,596	1,000,928	263,224	13.8	4,229,757	2,744,712	842,325	45.6	710,684	466,810	153,441	15.4
Maryland					5,913,153	2,995,931	1,021,629	24.3				
Massachusetts	7,536,369	4,942,064	1,355,835	20.6	12,060,841	7,417,652	2,291,632	33.3				
Michigan	8,259,063	5,030,856	141,595	114.9	20,332,846	13,017,652	203,264	349.5	6,045,617	3,963,518	26,122	176.0
Minnesota	2,427,399	1,185,689	212,711	150.9	9,635,730	5,456,886	403,515	441.7	3,230,096	1,909,283	158,843	243.2
Mississippi	486,300	165,297		10.5	10,419,127	6,374,195	18,000	297.6	1,514,658	954,895		50.4
Missouri	2,337,083	1,264,874	248,748	63.4	12,497,886	8,038,715	2,506,673	390.3	9,504,033	6,233,952	1,979,939	317.5
Montana	4,666,579	3,118,457	768,341	101.9	8,806,062	6,079,897	1,553,037	259.4	1,315,158	954,770	234,980	59.7
Nebraska	915,710	499,372	160,850	23.5	10,346,620	6,628,717	2,047,895	212.1	1,297,640	842,640	260,285	37.3
Nevada	1,703,631	1,295,804	82,300	34.7	2,568,025	2,066,493	144,766	60.3	2,120,981	1,887,548	152,990	50.5
New Hampshire					2,887,505	1,797,880		13.5	509,015	334,943		4.8

New Jersey	8,953,200	5,767,366	1,917,856	29.6	11,688,056	7,585,212	2,303,432	39.5	163,416	107,794	----------	1.6
New Mexico	4,643,754	3,395,113	773,984	58.7	7,002,946	5,170,877	1,049,880	106.6	3,415,251	2,474,735	493,749	55.4
New York	12,390,400	6,902,772	1,826,072	65.5	32,601,633	19,183,972	5,919,806	190.7	4,075,330	2,493,638	831,213	41.6
North Carolina	5,183,260	3,455,360	960,522	138.8	12,638,670	8,292,810	2,531,102	311.5	6,727,410	4,484,810	1,494,875	208.9
North Dakota	1,728,205	1,152,136	274,014	90.0	6,176,383	4,117,588	1,262,498	367.0	1,171,908	781,272	260,424	60.0
Ohio	6,241,099	3,266,366	1,003,855	90.3	25,707,078	15,876,379	4,904,896	727.9	9,691,220	5,579,412	1,652,132	456.6
Oklahoma	429,000	262,982	86,974	13.7	4,320,806	2,847,857	885,393	130.5	10,018,501	6,459,822	1,995,791	151.4
Oregon	1,760,047	1,144,050	242,429	41.7	7,901,008	5,488,046	1,160,056	118.8	1,248,664	903,726	178,808	44.0
Pennsylvania	12,554,965	8,289,778	2,330,983	42.6	28,962,478	19,217,078	5,936,982	139.1	1,347,600	898,400	299,466	7.8
Rhode Island	630,879	414,046	126,240	16.2	3,238,339	2,152,026	656,240	48.8	1,117,925	743,240	226,570	26.0
South Carolina	79,000	47,400	----------	6.5	7,489,040	4,339,272	----------	261.5	2,385,900	1,272,472	----------	43.2
South Dakota	2,896,014	1,712,994	189,104	227.0	6,075,153	3,955,866	813,210	362.3	3,788,217	2,460,870	620,082	222.8
Tennessee	2,010,265	1,189,926	194,307	69.1	12,668,920	8,295,696	2,562,897	305.8	6,808,788	4,455,272	1,371,979	164.7
Texas	16,714,931	9,344,220	4,455,372	475.8	25,434,554	15,049,020	5,683,872	692.8	18,914,180	12,105,900	3,772,500	628.7
Utah	490,053	324,428	----------	9.5	4,754,423	3,798,038	----------	72.5	2,621,399	2,030,815	----------	43.4
Vermont	72,362	48,241	29,784	1.5	1,521,890	882,607	253,823	11.4	462,952	307,300	102,424	10.9
Virginia	3,079,254	1,900,959	482,430	89.4	11,607,371	7,465,576	2,307,144	463.5	5,289,612	3,415,767	1,038,332	366.4
Washington	1,309,610	906,996	218,055	20.9	6,835,657	4,687,935	1,113,493	193.6	3,903,356	2,664,764	590,530	207.7
West Virginia	2,222,310	1,355,097	365,009	30.3	5,012,621	3,195,984	959,853	74.1	2,181,925	1,451,873	483,957	104.9
Wisconsin	4,659,246	2,600,014	782,091	129.0	14,970,471	8,751,943	2,695,400	313.0	5,086,253	2,994,788	985,575	133.6
Wyoming	848,360	484,832	62,823	31.0	3,227,436	2,298,637	439,668	58.8	645,360	491,061	102,026	19.0
District of Columbia	1,025,041	346,859	137,540	2.0	3,491,580	2,059,157	628,606	5.7	1,713,072	1,141,538	380,513	3.8
Hawaii	981,580	556,155	140,540	9.1	981,580	556,155	140,540	9.1	705,750	372,275	79,240	8.0
Puerto Rico	12,927	8,618	2,663	----------	3,731,044	2,328,380	719,336	11.0	57,391	38,261	11,820	----------
Total	190,707,234	117,038,906	32,415,082	3,789.8	531,079,968	338,944,274	88,155,834	10,829.8	176,769,058	115,097,719	30,218,471	5,584.2

[1] Initial commitment of funds.

Table 16.—Status of program authorized by secs. 2(a) and 2(e) ("D" and "L" funds, respectively) of the 1958 act as of June 30, 1959, by program and by State

State or territory	Primary			Secondary			Urban			Total			
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds		Miles
											"D" funds	"L" funds	
Alabama	$9,487,119	$8,085,236	178.2	$2,291,394	$2,012,208	73.2	$552,200	$490,838	8.9	$12,330,713	$8,089,185	$2,499,097	260.3
Alaska	3,213,231	2,308,388	69.0	3,722,852	3,294,353	66.8	1,064,091	957,682	3.2	8,000,174	6,178,599	381,824	139.0
Arizona	1,474,434	1,382,428	11.5	4,017,662	3,662,396	63.1	480,088	443,769	2.2	5,972,184	4,806,198	682,394	76.8
Arkansas	3,506,730	3,015,778	141.1	5,382,043	4,598,698	207.0	162,820	83,075	3.2	9,051,593	5,880,738	1,816,813	351.3
California	21,031,503	16,395,768	64.7	8,539,817	5,559,720	130.4	6,782,822	5,407,037	7.7	36,354,142	22,073,488	5,289,037	202.8
Colorado	7,553,373	6,311,102	163.9	1,152,854	967,357	24.8	646,398	556,814	5.0	9,352,625	6,259,199	1,576,074	193.7
Connecticut	4,596,601	3,502,495	28.6	1,532,682	1,280,353	7.1	147,879	104,046	.7	6,277,162	3,733,466	1,153,428	36.4
Delaware	1,404,000	1,248,000	14.9	1,157,000	985,430	7.4				2,561,000	1,706,285	527,145	22.3
Florida	7,718,477	6,785,593	122.7	2,095,159	1,729,989	182.0	57,059	50,719	2.6	9,870,695	6,544,442	2,021,859	307.3
Georgia	9,720,984	8,403,965	209.1	3,353,139	2,971,548	69.7	631,071	560,952	12.0	13,705,194	9,119,163	2,817,302	290.8
Idaho	1,293,498	1,065,279	42.3	4,137,657	3,710,996	123.6				5,431,155	3,936,209	840,066	165.9
Illinois	18,435,274	16,011,702	364.3	8,015,207	5,595,721	206.0	1,164,565	1,031,997	3.6	27,615,046	17,803,047	4,836,373	573.9
Indiana	12,934,012	11,076,406	194.8	1,903,313	1,414,355	55.7				14,837,325	9,542,632	2,948,129	250.5
Iowa	8,048,843	6,615,997	145.8	4,830,462	3,931,251	252.6	691.648	608,934	3.2	13,570,953	8,523,047	2,633,135	401.6
Kansas	6,986,339	5,574,142	136.2	4,848,360	4,183,008	342.7	1,053,976	875,785	3.4	12,888,675	8,123,299	2,509,636	482.3
Kentucky	4,772,451	4,071,839	22.8	5,998,743	5,272,476	89.9				10,771,194	7,138,825	2,205,490	112.7
Louisiana	3,279,840	2,915,380	50.2	6,804,536	5,338,012	149.4				10,084,376	6,305,387	1,948,005	199.6
Maine	4,060,016	3,435,975	50.7	517,135	459,136	4.7				4,577,151	2,975,768	919,343	55.4
Maryland	7,425,153	5,361,560	24.3				400,000	390,500		7,825,153	4,394,431	1,357,629	24.3
Massachusetts	9,578,434	7,556,137	29.5	287,624	253,585	.6	2,194,783	1,899,561	3.2	12,060,841	7,417,652	2,291,632	33.3
Michigan	9,331,397	5,948,152	131.7	6,416,249	4,341,697	223.8	5,845,000	3,770,848	20.4	21,592,646	13,857,433	203,264	375.9
Minnesota	7,525,172	4,629,632	126.9	5,976,340	3,605,993	363.6	2,709,577	1,712,271	7.1	16,211,089	9,544,381	403,515	497.6
Mississippi				10,419,127	6,392,195	297.7				10,419,127	6,374,195	18,000	297.7
Missouri	11,712,006	9,750,466	110.2	5,289,452	4,701,693	298.7				17,001,458	11,041,091	3,411,067	408.9
Montana	5,860,703	5,049,806	146.1	3,261,667	2,870,517	121.7				9,122,370	6,325,284	1,595,039	267.8
Nebraska	6,963,540	5,799,867	135.3	3,383,080	2,876,745	76.8				10,346,620	6,628,717	2,047,895	212.1
Nevada	3,901,893	3,737,602	69.4	658,836	390,558	31.4				4,560,729	3,839,673	288,487	100.8
New Hampshire	1,552,426	907,828	9.4	978,247	652,164	.8	356,832	237,888	3.3	2,887,505	1,797,880		13.5

New Jersey	8,388,600	7,183,356	24.7	999,756	661,114	3.5	2,299,700	2,044,174	11.3	11,688,056	7,585,212	2,303,432	39.5
New Mexico	1,976,844	1,813,241	23.4	5,026,102	4,407,516	83.2				7,002,946	5,170,877	1,049,880	106.6
New York	24,881,903	19,651,487	160.3	7,793,707	6,123,323	45.5	10,653,365	7,950,262	11.7	43,328.975	25,765,119	7,959,953	217.5
North Carolina	11,657,830	10,117,785	303.6	2,270,160	1,946,332	35.3	611,780	449,640	3.3	14,539,770	9,560,200	2,953,557	342.2
North Dakota	2,421,720	2,152,640	123.1	4,345,189	3,752,358	269.8				6,766,909	4,511,272	1,393,726	392.9
Ohio	10,113,072	8,529,742	398,3	12,362,204	9,584,875	269.2	3,231,802	2,666,658	60.4	25,707,078	15,876,379	4,904,896	727.9
Oklahoma	5,903,041	4,916,753	57.6	3,492,406	3,010,546	116.7	2,443,354	2,109,755	6.4	11,838,801	7,668,061	2,368,993	180.7
Oregon	3,752,707	3,382,200	30.9	3,115,924	2,583,382	88.5	1,584,227	1,174,531	5.5	8,452,858	5,898,916	1,241,197	124.9
Pennsylvania	21,480,113	18,642,027	99.4	6,784,950	6,002,833	38.6	697,415	509,200	1.1	28,962,478	19,217,078	5,936,982	139.1
Rhode Island	2,214,140	1,917,240	43.1	1,124,729	978,426	5.7				3,338,869	2,219,046	676,620	48.8
South Carolina	4,943,200	2,963,000	129.3	3,315,100	1,985,300	152.0	457,240	118,572	1.0	8,715,540	5,066,872		282.3
South Dakota	4,650,110	3,937,934	182.7	2,735,409	2,012,844	220.0				7,385,519	4,880,326	1,070,452	402.7
Tennessee	7,803,268	6,533,569	121.8	4,456,782	3,961,584	176.0	408,870	363,440	8.0	12,668,920	8,295,696	2,562,897	305.8
Texas	25,855,606	21,419,292	670.6	10,729,156	7,894,700	345.2	3,022,218	2,538,900	12.1	39,606,980	24,334,820	7,518,072	1,027.9
Utah	3,580,006	2,868,318	48.6	726,334	598,854	19.4	448,083	330,865	4.5	4,754,423	3,798,038		72.5
Vermont	2,162,324	1,706,697	15.6	527,254	461,719	6.8				2,689,578	1,656,616	511,800	22.4
Virginia	4,894,491	3,981,039	198.9	6,518,384	5,723,729	265.1	478,560	319,038	2.5	11,891,435	7,657,939	2,365,867	466.5
Washington	5,890,172	5,281,709	116.2	3,620,163	2,918,097	152.7	40,914	36,687	1.3	9,551,249	6,562,235	1,674,258	270.2
West Virginia	925,534	819,208	23.8	5,157,922	4,414,426	128.1	626,000	426,841	.6	6,709,456	4,324,463	1,336,012	152.5
Wisconsin	7,630,038	5,598,038	170.8	5,825,723	4,625,267	144.0	2,086,871	1,686,038	4.8	15,542,632	9,098,443	2,810,900	319.6
Wyoming	5,310,436	4,635,262	97.0							5,310,436	3,886,714	748,548	97.0
District of Columbia	2,358,690	2,071,178	3.2	1,598,099	1,029,660	3.8				3,956,789	2,368,963	731,875	7.0
Hawaii	2,917,066	2,406,145	13.2							2,917,066	1,838,235	567,910	13.2
Puerto Rico	1,551,560	1,323,335	7.4				2,891,984	2,340,090	6.7	4,443,544	2,798,766	864,659	14.1
Total	366,629,920	300,979,718	5,857.1	199,496,090	157,729,039	6,040.3	56,923,192	44,247,407	230.9	623,049,202	400,000,000	102,744,164	12,128.3

Table 17.—Mileage of designated Federal-aid highway systems, by State, as of Dec. 31, 1958

State or territory	National System of Interstate and Defense Highways			Federal-aid primary highway system [1]			Federal-aid secondary highway system		
	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
	Miles	*Miles*	*Miles*	*Miles*	*Miles*	*Miles*	*Miles*	*Miles*	*Miles*
Alabama	873	773	100	6,332	5,667	665	19,226	18,820	406
Alaska				1,960	[2] 1,945	15	3,290	3,284	6
Arizona	1,161	1,130	31	2,648	2,565	83	3,986	3,829	157
Arkansas	523	482	41	3,922	3,681	241	14,180	13,986	194
California	2,183	1,731	452	7,531	6,345	1,186	11,043	10,361	682
Colorado	964	933	31	4,266	4,135	131	4,083	4,037	46
Connecticut	304	165	139	1,288	888	400	1,151	1,000	151
Delaware	39	35	4	583	535	48	1,417	1,401	16
Florida	1,142	1,028	114	5,384	4,841	543	13,048	12,752	296
Georgia	1,111	969	142	8,767	8,101	666	13,735	13,579	156
Idaho	611	599	12	3,153	3,081	72	5,112	5,069	43
Illinois	1,612	1,401	211	10,656	9,449	1,207	13,221	12,986	235
Indiana	1,097	970	127	4,888	4,251	637	16,543	16,324	219
Iowa	709	658	51	10,314	9,737	577	33,092	32,856	236
Kansas	803	692	111	7,833	7,401	432	23,195	23,047	148
Kentucky	700	644	56	4,553	4,253	300	15,225	15,076	149
Louisiana	681	590	91	3,330	2,952	378	7,723	7,587	136
Maine	313	293	20	1,931	1,795	136	2,294	2,239	55
Maryland	354	216	138	2,291	1,873	418	6,224	5,947	277
Massachusetts	462	274	188	2,323	1,502	821	2,187	1,646	541
Michigan	1,076	955	121	7,552	6,874	678	24,853	24,521	332
Minnesota	891	763	128	8,788	8,108	680	19,741	19,580	161
Mississippi	673	610	63	5,820	5,577	243	13,651	13,484	167
Missouri	1,102	981	121	9,147	8,620	527	23,266	23,163	103
Montana	1,180	1,168	12	6,246	6,150	96	4,997	4,978	19
Nebraska	488	478	10	5,656	5,500	156	17,749	17,713	36
Nevada	534	524	10	2,196	2,162	34	2,656	2,642	14
New Hampshire	213	194	19	1,205	1,095	110	1,601	1,555	46
New Jersey	368	208	160	2,060	1,279	781	2,074	1,554	520
New Mexico	1,003	978	25	4,027	3,841	186	5,378	5,331	47
New York	1,227	816	411	10,403	8,247	2,156	19,376	17,801	1,575
North Carolina	773	732	41	7,061	6,622	439	24,845	24,551	294

North Dakota	570	560	10	4,197	4,138	59	13,283	13,263	20
Ohio	1,490	1,272	218	9,000	7,749	1,251	17,715	17,209	506
Oklahoma	796	721	75	8,253	7,796	457	12,464	12,326	138
Oregon	732	675	57	4,028	3,800	228	7,442	7,365	77
Pennsylvania	1,527	1,289	238	8,464	7,151	1,313	13,317	12,363	954
Rhode Island	71	32	39	534	289	245	414	276	138
South Carolina	679	662	17	5,336	5,038	298	15,416	15,267	149
South Dakota	679	671	8	6,054	5,967	87	12,092	12,073	19
Tennessee	1,047	927	120	5,496	5,167	329	10,204	10,155	49
Texas	3,028	2,609	419	17,282	15,614	1,668	30,107	29,577	530
Utah	965	922	43	2,312	2,232	80	3,644	3,578	66
Vermont	321	309	12	1,586	1,508	78	1,819	1,796	23
Virginia	1,066	971	95	5,532	5,062	470	18,315	18,127	188
Washington	727	596	131	3,990	3,671	319	10,711	10,456	255
West Virginia	395	375	20	2,767	2,559	208	10,688	10,596	92
Wisconsin	452	420	32	6,352	5,861	491	18,610	18,270	340
Wyoming	931	916	15	3,637	3,581	56	2,183	2,172	11
District of Columbia	29		29	142		142	82		82
Hawaii				533	495	38	649	639	10
Puerto Rico				561	427	134	1,082	1,041	41
Total	[3] 40,675	35,917	4,758	260,170	237,177	22,993	570,399	559,248	11,151

[1] Figures include the mileage of the Interstate System.
[2] Alaska includes 346 miles of ferry routes.
[3] 325 miles within the 41,000-mile limitation are not assigned to routes, and are held in reserve for adjustments of route lengths as final locations are selected and projects built.

Table 18.—Status of national forest highway projects as of June 30, 1959, and projects completed during the fiscal year [1]

State or territory	Programed,[2] construction not yet authorized			Construction authorized, not started			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama										$94, 300	$40, 000	7. 7
Alaska	$3, 665, 000	$3, 215, 000	22. 6				$3, 611, 225	$2, 563, 225	17. 9	726, 201	726, 201	21. 2
Arizona	1, 175, 000	1, 175, 000	48. 3	$745, 322	$745, 322	15. 3	972, 740	972, 740	22. 4	1, 728, 857	1, 728, 857	44. 4
Arkansas	788, 790	344, 395	15. 2	955, 154	477, 577	24. 8	368, 170	184, 085	9. 0	288, 982	141, 322	8. 6
California	4, 265, 000	4, 265, 000	16. 0	2, 360, 000	2, 360, 000	28. 7	2, 694, 500	2, 694, 500	20. 0	4, 013, 019	3, 916, 019	56. 4
Colorado	1, 830, 000	1, 830, 000	44. 3	1, 677, 000	1, 677, 000	18. 9	1, 927, 000	1, 927, 000	17. 7	1, 113, 427	1, 113, 427	9. 3
Florida							1, 234, 029	616, 893	27. 3	312, 615	155, 968	11. 5
Georgia							643, 560	419, 068	7. 4			
Idaho	2, 200, 000	2, 200, 000	24. 4	1, 134, 000	1, 134, 000	14. 1	3, 259, 443	3, 259, 443	51. 4	3, 003, 219	3, 003, 219	75. 5
Illinois	60, 000	30, 000	. 8				286, 100	143, 050	3. 3			
Indiana										251, 704	125, 419	. 6
Kentucky	125, 000	125, 000	5. 2									
Louisiana							404, 820	202, 410	8. 6	82, 920	41, 460	3. 8
Maine				31, 700	31, 700	4. 0						
Michigan	450, 000	450, 000	14. 9				953, 100	625, 700	21. 2	144, 014	73, 775	9. 9
Minnesota	290, 000	290, 000	4. 2	146, 655	123, 978	4. 9	490, 940	479, 380	10. 1			
Mississippi	488, 194	488, 194	11. 1							343, 500	343, 500	1. 0
Missouri	161, 872	161, 872	13. 6				259, 467	259, 467	. 8	84, 517	84, 517	4. 9
Montana	2, 650, 000	2, 650, 000	69. 3	747, 100	717, 100	23. 0	2, 639, 206	2, 639, 206	63. 7	590, 192	590, 192	28. 7
Nebraska				104, 730	104, 730	3. 1						
Nevada	360, 000	160, 000	3. 0	395, 000	395, 000	12. 3	1, 020, 000	1, 020, 000	12. 3	270, 000	270, 000	4. 4
New Hampshire	181, 184	181, 184	7. 2				287, 617	287, 617	2. 5			
New Mexico	1, 180, 000	1, 180, 000	30. 4				1, 674, 000	1, 674, 000	27. 6	391, 200	391, 200	7. 8
North Carolina							618, 460	309, 230	3. 4	138, 000	69, 000	6. 8
Ohio										33, 572	33, 572	1. 6
Oklahoma				24, 000	24, 000							
Oregon	2, 858, 500	2, 858, 500	20. 7	2, 491, 133	2, 047, 200	54. 5	5, 146, 500	5, 146, 500	81. 5	2, 782, 836	2, 782, 836	33. 4
Pennsylvania	366, 000	183, 000	2. 5							167, 198	167, 198	5. 1

South Carolina	14,000	6,300		270,200	149,000	17.1	476,700	219,200	32.1	24,000	12,000	1.4
South Dakota				275,000	275,000	2.7				177,000	177,000	
Tennessee							716,674	358,337	5.2			
Texas	108,500	108,500	4.9	301,000	150,500	10.0	143,000	71,500	7.3	176,200	88,100	9.3
Utah	1,220,000	1,220,000	18.4	698,000	698,000	7.6	379,000	379,000	13.8	946,970	946,970	52.5
Vermont	90,151	90,151	.9				101,650	101,650	.8			
Virginia	462,000	462,000	14.8				241,027	230,023	8.5	369,285	231,576	3.0
Washington	2,773,000	2,773,000	23.0	1,158,200	1,158,200	7.6	1,450,740	1,450,740	20.5	1,122,527	1,122,527	10.2
West Virginia	376,000	376,000	10.9	71,800	35,900	5.8	36,000	36,000				
Wisconsin	183,400	183,400	4.7				244,353	244,353	6.6			
Wyoming	1,380,000	1,380,000	18.5				1,528,000	1,528,000	15.3	1,706,700	1,706,700	10.4
Puerto Rico							68,627	68,627	.4			
Total	29,701,591	28,386,496	449.8	13,585,994	12,304,207	254.4	33,876,648	30,110,944	518.6	21,082,955	20,082,555	429.4

[1] Includes construction projects only. [2] Initial commitment of funds.

Table 19.—Mileage of the national forest highway system, by forest road class and by State, as of June 30, 1959

Region and State or territory	Total	Class 1 [1]	Class 2 [2]	Class 3 [3]
West:	*Miles*	*Miles*	*Miles*	*Miles*
Alaska	446.2	166.4	245.0	34.8
Arizona	1,055.3	325.8	558.9	170.6
California	2,454.5	1,070.4	320.2	1,063.9
Colorado	1,482.2	573.0	537.2	372.0
Idaho	1,216.7	648.9	324.6	243.2
Montana	1,193.7	685.8	228.2	279.7
Nevada	368.9	155.0	164.2	49.7
New Mexico	642.3	131.2	413.4	97.7
Oregon	1,443.3	686.1	720.7	36.5
South Dakota	300.2	187.1	101.1	12.0
Utah	735.9	224.2	230.8	280.9
Washington	743.5	482.0	207.2	54.3
Wyoming	470.5	344.4	107.6	18.5
Total West	12,553.2	5,680.3	4,159.1	2,713.8
East:				
Alabama	374.4	82.3	258.0	34.1
Arkansas	633.3	96.7	536.6	
Florida	289.8	32.7	211.3	45.8
Georgia	366.7	152.6	185.8	28.3
Illinois	301.8	241.3	45.7	14.8
Indiana	101.2	53.6	47.6	
Iowa	20.0	11.3	8.3	.4
Kentucky	351.4	131.1	211.2	9.1
Louisiana	398.2	54.1	169.8	174.3
Maine	14.0			14.0
Michigan	1,163.8	590.8	549.2	23.8
Minnesota	703.8	311.6	321.7	70.5
Mississippi	547.3	323.9	208.4	15.0
Missouri	978.8	370.7	590.1	18.0
Nebraska	23.5		23.5	
New Hampshire	158.0	61.9	39.6	56.5
North Carolina	830.0	365.5	423.2	41.3
Ohio	133.6	70.4	43.1	20.1
Oklahoma	46.2	29.6	16.6	
Pennsylvania	353.9	118.4	85.9	149.6
South Carolina	774.9	238.2	467.0	69.7
Tennessee	568.7	179.8	329.5	59.4
Texas	347.2	128.3	187.2	31.7
Vermont	119.1	32.7	61.9	24.5
Virginia	1,406.4	371.0	924.4	111.0
West Virginia	495.4	78.4	364.7	52.3
Wisconsin	469.1	75.7	352.4	41.0
Puerto Rico	42.5		42.5	
Total East	12,013.0	4,202.6	6,705.2	1,105.2
Grand total	24,566.2	9,882.9	10,864.3	3,819.0

[1] Forest roads which are on the Federal-aid primary system.
[2] Forest roads which are on the Federal-aid secondary system.
[3] Other forest highways.

Table 20.—Mileage of highways in national parks, monuments, and parkways, constructed under the direct supervision of the Bureau of Public Roads during the fiscal year ended June 30, 1959

Park, monument, or parkway (and State)	Under construction as of June 30, 1959	Completed during fiscal year
	Miles	*Miles*
Acadia (Maine)		2.7
Arches (Utah)		9.2
Badlands (S. Dak.)	10.3	5.2
Big Bend (Texas)	3.4	2.3
Blue Ridge (Va.–N.C.)	82.6	82.7
Colonial Park (Va.)		4.9
Colonial Parkway (Va.)		13.0
Dinosaur (Colo.–Utah)		6.2
Everglades (Fla.)		16.9
Foothills (Tenn.)	1.4	1.9
George Washington Memorial (Md.–Va.)	14.0	2.5
Glacier (Mont.)		12.6
Grand Teton (Wyo.)	4.2	24.2
Great Smoky Mountains (N.C.–Tenn.)	7.3	.1
Mesa Verde (Colo.)	5.3	
Mt. McKinley (Alaska)	14.5	
Mt. Rainier (Wash.)	3.2	13.7
Natchez Trace (Ala.–Miss.–Tenn.)	76.6	23.4
National Capital (D.C.)	.3	
Olympic (Wash.)	.1	13.3
Rocky Mountain (Colo.)	2.5	
Shenandoah (Va.)	.8	11.2
Theodore Roosevelt (N. Dak.)	6.9	
Vicksburg (Miss.)	1.6	
Yellowstone (Wyo.)	.6	24.9
Yosemite (Calif.)	16.7	3.4
Zion (Utah)	1.5	
Total	253.8	274.3

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